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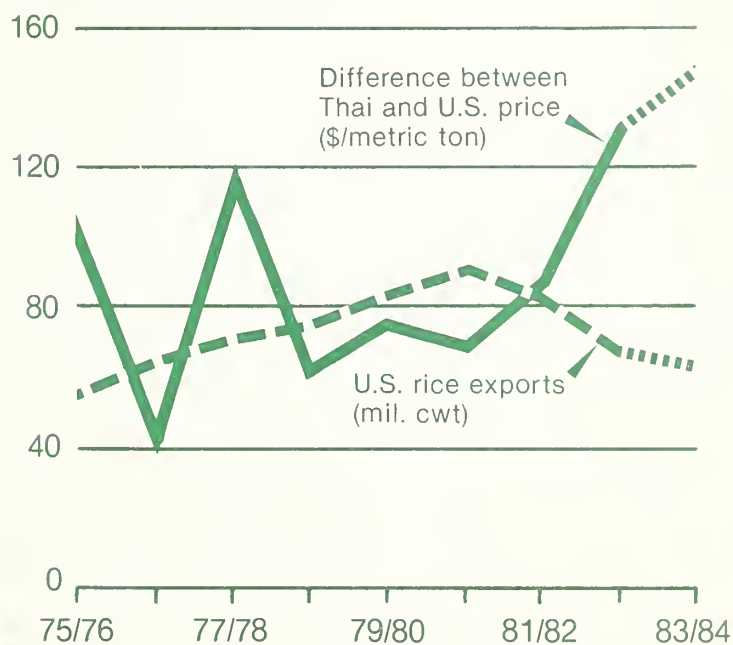
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March 1984

Rice

Outlook and Situation Report

Widening Thai-U.S. Price Gap Hurts Our Exports, page 5



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Summary

Producers have a strong incentive to participate in the 1984/85 rice program. It calls for producers to reduce planted acreage by 25 percent to be eligible for price support under a target level of \$11.90 per cwt and a loan rate of \$8.00 per cwt. The target price is well above this season's farm prices. Program enrollment reports are not yet available, but spring planting intentions signal another year of high participation. In early February, producers expressed intentions to plant about 2.8 million acres to rice—up significantly from the PIK-reduced acreage of 1983, but still far below the estimated rice base of 4 million acres.

U.S. harvested rice acreage and production in 1983/84 dropped to their lowest levels in 10 years, as producers withdrew an estimated 1.5 million acres from production under the acreage reduction and PIK programs.

Rice production plunged 35 percent from the previous year to 99.7 million cwt, but record beginning stocks of 71.5 million brought total supplies up to 172 million cwt—enough to satisfy demand and still leave a substantial carryover.

Domestic use and prices are increasing from last season but rice exports continue to slip. Domestic disappearance may claim 60 million cwt, but exports are currently forecast down 6 percent from last season to 65 million in 1983/84, because of less competitive U.S. prices. August-December average farm prices were \$8.63 per cwt, low enough to generate a \$2.77-per-cwt deficiency payment to eligible producers. Despite the low 5-month average, farm prices were almost \$1 per cwt above the same period in 1982. Average prices are forecast between \$8.50 and \$9.00 per cwt this season.

By type, long grain supplies continue to be much tighter than medium grain because of an unusually heavy medium grain carryin. Long grain ending stocks could fall to as little as 10 million cwt, while medium and short grain combined remain at a hefty 30 million. Total carryover for the season may fall below 40 million cwt—about a 45-percent cut from last season.

World rice production in 1983/84 is currently forecast at a record 438 million tons despite the 35-percent decline in U.S. production. Recoveries from drought-reduced crops in India and a few other countries are mainly responsible for the increased world output. World ending stocks continue to fall, but this season the drop in the U.S. rice carryover is a major reason for the decline in world stocks to an estimated 16.1 million tons, the lowest in a decade.

On a calendar year basis, world rice trade is expected to decline from 12.1 million tons in 1983 to 11.7 million in 1984. Two-thirds of the decline likely will come from lower U.S. exports. Foreign trade may decline from 9.8 to 9.6 million tons in 1984.

This issue of the Rice Outlook and Situation takes an in-depth look at world rice trade. U.S. exports by type—regular milled, brown, and parboiled—are examined over a 10-year period. Imports of six key buyers are also analyzed. The vantage points provide a perspective on the past and current role of U.S. rice exports and some implications for future growth. In some markets, the United States has remained a primary supplier, keeping up with growing rice demand. But in other markets, although import demand has increased, conditions have changed and the United States has taken a back seat to Thai rice exports.

1983/84 SITUATION AND OUTLOOK

Acreage and Production Drop to Lowest Levels in 10 Years

The 1983/84 crop year will likely post some new highs and lows for the U.S. rice industry. Harvested acreage dropped to 2.17 million acres, the lowest in a decade, due to record enrollment in the acreage reduction and payment-in-kind programs. Normally, a substantial amount of acreage withdrawn from production results in increased yields per acre, as producers tend to idle their least productive land. But bad weather kept yields from rising, and in most States yields declined modestly: The U.S. average dipped 2 percent from 1982, and 5 percent from the record yields of 1981.

Because yields did not rise and acreage fell by more than a third of the previous year, production declined dramatically, posting a decade low. U.S. production of 99.7 million cwt in 1983 was 35 percent lower than 1982 and 45 percent below the 1981 record.

The drop in harvested acreage and production was not evenly distributed by type of rice or among the States. Production and acreage varied by type in the following ways:

- *Long grain* harvested acres fell 28 percent from 1982 and 37 percent from 1981. Harvested acres totaled 1.56 million, compared with almost 2.2 million in 1982 and 2.5 million in 1981. With average yields slipping 3 percent to 4,169 pounds per acre, production followed suit. Long grain production in 1983 totaled 65 million cwt, down 30 percent from 1982 and 41 percent from 1981.
- *Medium grain* harvested acres posted the biggest decline of all types in 1983, falling by almost half the previous year's acreage. Harvested acres of medium grain rice were only 492,000, compared with 950,000 in 1982 and 1.2 million in 1981. But yields were unchanged, so the drop in medium grain production was all due to declines in acreage. Production totaled 26.6 million cwt, down 48 percent from 1982 and 57 percent from 1981's record 61.5 million.
- *Short grain* rice showed the smallest decline in harvested acres and production. Harvested acres totaled 117,000, 14 percent less than 1982 and 27 percent less than 1981. Average yields actually rose 7 percent from 1982's 6,499 pounds per acre to 6,932 in 1983. The increase in average yields softened the decline in harvested acreage, and production fell only 9 percent from a year earlier. Short grain production totaled 8.1 million cwt, compared with 8.9 million in 1982 and 10.8 million in 1981.

Long grain rice claimed 65 percent of the total U.S. rice harvested in 1983, up from 61 percent of the 1982 crop and 60 percent of the 1981 crop. Short grain's share of the U.S. rice crop also rose and accounted for 8 percent of the much-reduced total, up from 6 percent in the 2 preceding crop years. Medium grain's share continues to fall, however. In 1981, medium grain claimed 34 percent

of the total crop; this share declined to 33 percent in 1982, and slid again to 27 percent in 1983. Weak demand and sluggish prices signaled farmers to reduce medium grain production. But a wider differential between long and medium/short grain rice prices and the loan rates announced for the 1983 crop likely encouraged a shift to long grain production in historically medium or short grain areas.

Among the States, California posted the biggest decline in harvested acres, but Louisiana had the largest drop in production.

- *Arkansas'* harvested acreage fell 31 percent, from 1.3 million acres in 1982 to 915,000. Average yields were virtually unchanged, so production fell by the same amount as acreage. Production of 39.2 million cwt in 1983 was 31 percent below 1982 and 44 percent below 1981.
- *California's* harvested acreage, at 328,000 acres, was 39 percent below 1982 and 45 percent below 1981. However, a boost in average yields kept production from falling more than 36 percent. California production totaled just over 23 million cwt, compared with almost 36 million in 1982 and 41 million in 1981. For the second consecutive year, California's long grain acreage rose—to 22,000—up from 14,000 in 1982.
- *Louisiana* harvested 385,000 acres in 1983, 39 percent under the level harvested in 1982, and more than 40 percent less than 1981. Yields posted the second largest decline of all the States, averaging 8 percent less than last year. Lower yields and acreage combined to give Louisiana the biggest production decline of all the States in 1983: Output fell 41 percent, from almost 25 million cwt in 1982 to 14.7 million.
- *Mississippi* had the largest decline in average yields, which dropped 9 percent from 1982. Combined with a 23-percent drop in harvested acres, Mississippi's crop totaled 6.4 million cwt, down from 10 million in 1982 and nearly 15 million in 1981.
- *Texas* was plagued by bad weather that prevented a good showing in a second crop. Average yields fell 7 percent from 1982, and Texas harvested 318,000 acres, compared with 474,000 in 1982 and nearly 580,000 in 1981. A 33-percent decline in harvested acreage and lower yields caused production to plunge 38 percent. The Texas rice crop totaled 13.8 million cwt, compared with 22.2 million last year and 27 million in 1981.

Across the board, rice producers harvested 34 percent fewer acres in 1983 than in 1982, and 43 percent less than the 1981 record. U.S. production fell 35 percent short of last year's level, and 45 percent below 1981's 182.7 million cwt. Producers withdrew an estimated 1.8 million acres from production, devoting those acres to conservation use in compliance with the 1983 rice program. Of the 1.8 million acres, about 1 million were idled for payment in kind.

Record Stocks Keep Supplies Plentiful for 1983/84

Despite the huge drop in production, total supplies for 1983/84 remain more than adequate. The season began with a record 71.5 million cwt of rice in stocks—of which approximately 40 million cwt were slated to be returned to producers as payment in kind for program participation. The carryin brought total supplies up to 172 million cwt, more than enough to satisfy current demand and leave a substantial carryover.

Long grain stocks, at 26.4 million cwt, accounted for 37 percent of the total carryin, and brought total long grain supplies for 1983/84 to 92 million cwt. Carryin of medium and short grain totaled more than 45 million cwt, boosting total supplies of those grains to 80 million this year.

January 1 Rice Stocks Down; Carryover May Fall Below 40 Million Cwt

Rough and milled rice stocks on January 1, 1984, were down considerably from a year earlier. Rough rice stocks—estimated at 114 million cwt—were 15 percent less than last January's level. On-farm storage of rice totaled 30.5 million cwt, compared with nearly 35 million the previous year. Milled stocks fell 8 percent from January 1, 1983, to 5.7 million this year.

The July 31 carryover is expected to fall below 40 million cwt—a 44-percent drop from 71.5 million on July 31, 1983. Such a significant anticipated cut has helped boost prices, and will likely add strength to rice prices throughout the remainder of the 1983/84 season.

August-December Prices Stronger Than a Year Ago

Farm prices during August-December 1983 averaged \$8.63 per cwt, almost \$1 above a year earlier. Because this was less than the target price, farmers who participated in the 1983 rice program received a deficiency payment of \$2.77 per cwt (the \$11.40 per cwt target price less the \$8.63 August-December farm price). For the

season, farm prices are forecast to range from \$8.50 to \$9.00 per cwt. Although prices in this range are still expected to be well below the target price for 1983-crop rice, a season average price of \$8.75—the midpoint of the forecast range—would be an improvement over prices during the 1982/83 season, which averaged only \$8.11 per cwt. Farm prices averaging within the forecast range for 1983/84 would also mean an increase in inflation-adjusted prices received by farmers—the first increase since 1980/81. In 1980/81, when the season average price for rice was \$12.80, the real price of rice measured in 1972 dollars was \$7.17. The real price continued to fall through 1982/83, when it averaged below \$4 per cwt, a record low. Higher farm prices this season will boost real prices above \$4 per cwt again.

Farm Value of Production Declines in 1983/84, But Net Returns Likely Up

The farm value of rice production in 1982/83 was \$1.25 billion. In 1983/84, the value may decline about 30 percent to around \$900 million. Farm value depends on the volume of production and average prices received by farmers. Although the 1983/84 rice crop is 35 percent less than the 1982/83 harvest, prices received by farmers may increase 8 percent from 1982/83, thus softening some of the decline in farm value. Payments to participants in the 1983 rice program are not included in the farm value of production, but they are still considered part of gross returns. Payments to producers in 1982/83 totaled roughly \$267 million. In 1983/84, payments are expected to be \$270 million, up slightly because of the additional paid land diversion provision. Income to producers in the 1983/84 crop year, excluding the value of PIK payments, may total less than \$1.2 billion, compared with \$1.5 billion in 1982/83.

The drop in gross income does not give a complete picture of rice sector returns for 1983/84. In 1982/83, total cash expenses for planting rice were about \$1.16 billion; returns above expenses were approximately \$360 million. However, in 1983/84, planted area was greatly reduced. Assuming roughly the same per-acre cash expenses as a year earlier, total cash expenses for planting the 1983/84 rice crop would be \$0.77 billion. Returns above cash expenses (excluding PIK payments and conservation costs on PIK acres) would total \$400 million. Final estimates of cash expenses for 1983/84 have not yet been completed.

Supply and Disappearance by Type: A Tighter Long Grain Market

Supplies of long grain rice in 1983/84 totaled 92 million cwt—30 percent in beginning stocks and 70 percent in production. Long grain domestic use may be 33 million of the 60 million forecast for total use, while long grain exports may reach 45 million. If long grain domestic use and exports reach these levels, total use (including a residual) would be 82 million cwt, enough to draw down the long grain carryover to 10 million cwt.

Although medium grain production was slashed almost 50 percent from 1982/83, beginning stocks of medium and short grain rice totaled 45 million cwt on August 1, 1983, 10 million cwt above 1983 production. The huge stocks brought total medium/short grain supplies very

Rough Rice Farm Prices and Loan Rates

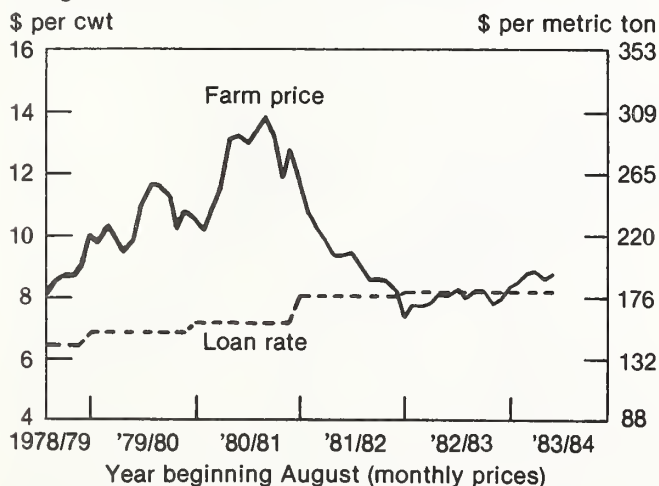


Table 1.—Estimated supply and disappearance, by type of rice¹

| Item | Total | Long | Medium/ short |
|------------------------|-------------|-------|------------------|
| 1982/83 | | | |
| | Million cwt | | |
| Beginning stocks | 49.0 | 18.1 | 30.9 |
| Production | 153.6 | 93.4 | 60.2 |
| Supply ² | 203.3 | 112.0 | 91.3 |
| Domestic disappearance | 54.0 | 30.0 | 24.0 |
| Exports | 68.9 | 47.0 | 21.9 |
| Total use ³ | 131.8 | 85.6 | 46.2 |
| Ending stocks | 71.5 | 26.4 | 45.1 |
| 1983/84 | | | |
| Beginning stocks | 71.5 | 26.4 | 45.1 |
| Production | 99.7 | 65.0 | 34.7 |
| Supply ² | 171.9 | 92.0 | 79.9 |
| Domestic disappearance | 60.0 | 33.0 | 27.0 |
| Exports | 65.0 | 45.0 | 20.0 |
| Total use ³ | 132.0 | 82.0 | 50.0 |
| Ending stocks | 39.9 | 10.0 | 29.9 |

¹Rough equivalent. ²Includes imports. ³Includes residual.

close to long grain—80 million cwt. Disappearance during August-December 1983 indicates total use of medium and short grain could be 50 million cwt. This would lower the medium/short grain carryover to 30 million cwt—a significant improvement over last year, but still a very high level of stocks.

Rice Program Announced for 1984/85; Strong Participation Expected

A 25-percent acreage reduction program was announced for rice, with strong participation expected. Producers who comply with program provisions will be eligible for support with a target price set at \$11.90, up from \$11.40 per cwt this year, and a marginally lower loan rate of \$8.00.

Spring planting intentions, released in the mid-February *Prospective Plantings* report, give some indication of producer response to the 1984 program announcement. Producers said they intend to plant 2.8 million acres to rice in 1984—nearly 30 percent more than under the 1983 PIK program, but still substantially less than 1981

planted acreage. Long grain planted acres would increase to 2.1 million—500,000 acres above 1983 and only 90,000 below 1982. According to the report, medium grain planted acreage would increase, but by less than long grain. Producers gave intentions to plant 618,000 acres to medium grain rice, compared with 500,000 in 1983 and close to 1 million in 1982. The strength of the long grain market relative to medium grain during the past 2 years, as well as the change in loan rates by type, are likely exerting a strong influence on intended plantings.

Producers of short grain rice indicated they would reduce plantings for the third year in a row. Short grain planted acreage would decline to 92,000 acres, down from 119,000 in 1983 and 140,000 in 1982. All of the decrease comes from California, which appears to have traded on an almost one-for-one basis short grain acreage with long grain. California's intended long grain acreage may reach 50,000—the third consecutive increase.

Among the States, the biggest increases in planted acreage will likely occur in the predominantly long grain producing States—Arkansas, Texas, and Mississippi. Arkansas' long grain acreage could reach 1.1 million acres—up 35 percent from the PIK-reduced levels of 1983. Texas producers gave intentions to increase long grain planted acreage nearly 50 percent over 1983 levels to about 460,000, compared with 310,000 in 1983, and 443,000 in 1982.

Outlook for 1984/85—Steady Supplies and Stocks

Unless actual planted acreage changes significantly from figures provided by the planting intentions report, and assuming normal weather and yields, rice production in 1984/85 could rise 30 percent over the current year's crop. But a significant drawdown in stocks this season from 71.5 million cwt to around 40 million, implies that total rice supplies will probably not vary dramatically from 1983/84. Carryover in 1984/85 will depend on the strength in demand. Because domestic use will likely continue to grow moderately, exports will be the key to carryover and price strength. If supplies remain fairly even with this season's level, and demand stays sluggish, the outlook for carryover is that of steady ending stocks, skewed toward medium grain rice.

Table 2.—Rice, rough: Price support activity by States, 1983-crop as of January 31, 1984

| State | Placed under loan | | | Loans redeemed | Loans outstanding |
|---------------|-------------------|------------|-----------|-------------------|----------------------|
| | Farms | Warehouses | Total | | |
| | | | 1,000 cwt | | |
| Arkansas | 5,476 | 6,995 | 12,471 | 369 | 12,102 |
| Florida | 28 | — | 28 | — | 28 |
| Louisiana | 1,595 | 984 | 2,579 | 87 | 2,492 |
| Mississippi | 2,400 | 283 | 2,683 | 303 | 2,380 |
| Missouri | 647 | 16 | 663 | 57 | 605 |
| Texas | 859 | 4,855 | 5,714 | 135 | 5,579 |
| California | 530 | 10,381 | 10,910 | — | 10,910 |
| United States | 11,535 | 23,514 | 35,049 | 951 | 34,098 |

— = 0

Compiled from reports of ASCS.

Record World Rice Production Forecast

The 1983/84 world rough rice crop is forecast at a record 438 million metric tons, up almost 4 percent from 1982/83. U.S. production, which accounts for less than 2 percent of the world crop, was off more than a third from a year earlier. The big reason for the global increase: India's rice crop is forecast to rise more than 20 percent from the drought-plagued 70 million tons produced in 1982/83 to 86 million this year. Other estimated increases include China—up 2 million tons despite bad weather; Bangladesh—up 1 million tons to 22.5 million in 1983/84; Thailand—up a million tons to 18 million; and Brazil—from 7.8 million tons in 1982/83 to 9 million this year.

Rice consumption is also expected to set a record in 1983/84. World rice consumption is forecast at 298 million tons, milled basis, up 3 percent from the previous year. Increases in India and South Korea reflect recoveries from drought-reduced levels in 1982/83.

World rice trade, on a calendar year basis, is forecast to decline from 12.1 million tons in 1983 to 11.7 million in 1984. About two-thirds of the drop will likely come from a continued decline in U.S. rice exports. Foreign trade is expected to decline from 9.8 to 9.6 million tons in 1984. Thai rice exports are expected to continue at last year's record level of 3.7 million tons. A recent agreement has been reached with Taiwan to limit their exports of subsidized rice; Taiwan rice exports are now forecast at 375,000 tons in 1984. For most major importers, demand for rice will likely continue at roughly the same levels as 1983. Imports by Indonesia, however, will likely fall from 1.2 million tons in 1983 to 750,000 tons in 1984. Offsetting some of the decline in Indonesian imports, India's rice imports are likely to double, from 310,000 tons in 1983 to about 625,000 in 1984.

World ending stocks are forecast to decline again, from 16.8 million tons in 1982/83 to 16.1 million in 1983/84. However, a significant drop in U.S. carryover more than offset increased foreign ending stocks. The rest of the

world will likely see ending stocks rise slightly to 14.8 million tons.

FOCUS ON FOREIGN DEMAND AND U.S. RICE EXPORTS

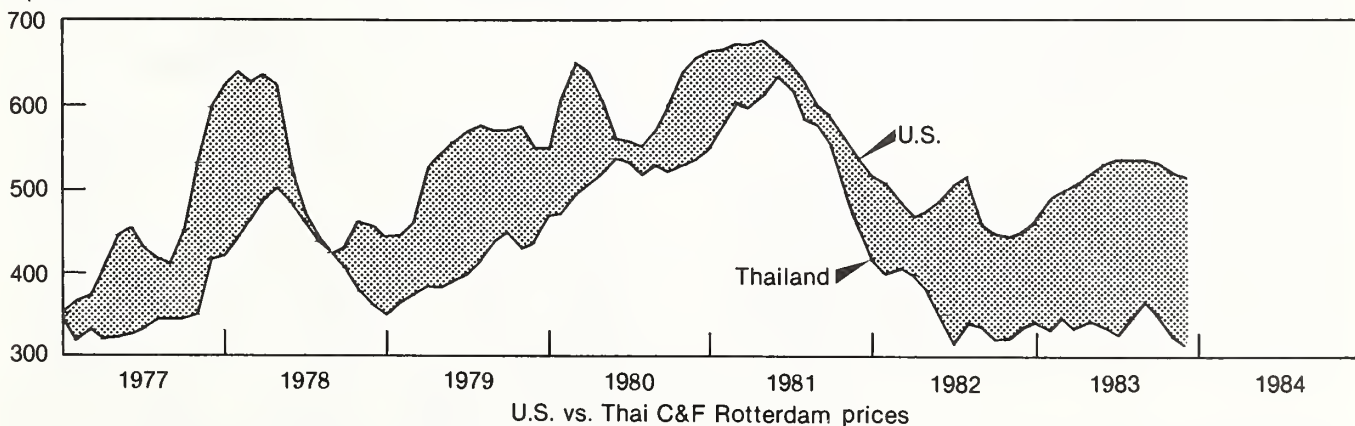
The "good years" for U.S. agriculture are increasingly tied to exports. This is acutely true for rice, where two-thirds of the U.S. crop is exported. U.S. rice exports have fallen 30 percent since 1980, and farm prices have gone into a tailspin. The quoted sources of blame for the plunge in U.S. exports have become: Economic recessions in many countries; debt and credit problems of many developing country importers; a high-valued U.S. dollar; a loan rate supporting U.S. rice prices that has led to an ever-widening gap between U.S. and Thai rice prices for comparable quality products; and good supplies in some competing exporting countries. Certainly, these are important factors, but the world rice market is complicated by other important factors: growing conditions that may result in a country moving from a net importer position to temporary self-sufficiency or, in the extreme—to a net exporter; errors in estimation by foreign governments of the appropriate level of stocks they must maintain to accomplish policy objectives; and losses in foreign exchange or other constraints that force countries to drop out of the world rice market or to become more price conscious and switch suppliers.

Explaining the drop in U.S. rice exports would be much easier if world imports had fallen by the same degree. But since world trade is carrying on despite a 30-percent slash in U.S. sales, it is worthwhile to look at the sources, levels, and types of foreign demand for rice over the past few years to uncover some clues. It is probably too simple to say that U.S. prices are too high. Evidence suggests prices are too high only for some types of rice and only for some buyers—buyers that can make the difference between a "good" year for the U.S. rice industry and a bad one.

The first section below looks at U.S. rice exports by type: All rice, white milled, parboiled, brown, and other

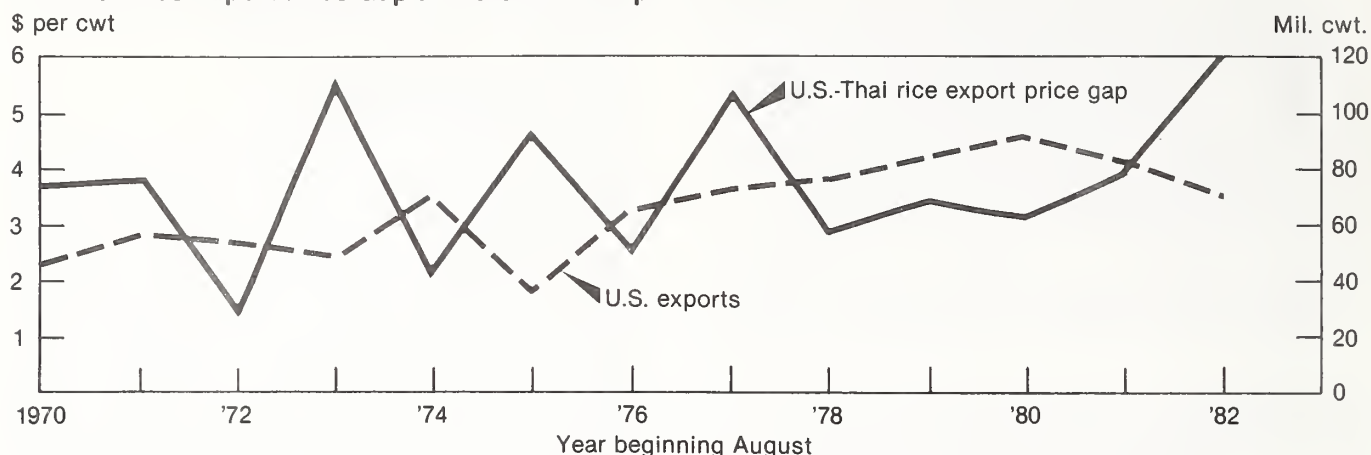
U.S. vs. Thai C&F Rotterdam Rice Prices*

\$ per metric ton



*Prices for U.S. No. 2 4 percent and Thai SWR 100 percent grade B.

U.S.-Thai Rice Export Price Gap and U.S. Rice Exports*



*U.S. exports are on a rough-equivalent basis.

(including rough and broken). Who have been the major importers of each of these rice types? What trends are apparent with respect to the volume of rice exported over the past few years? Among the broad types of rice exported, the regular milled and brown rice markets have swung between disappointment and excitement. Parboiled rice exports climbed steadily, to a peak of 1 million tons in 1981/82, but declined to 800,000 the following year.

The second section looks at the overall import demand of six countries that, at one time or another, have been among the largest importers of U.S. rice. The relative importance of U.S. rice to these markets is apparent when compared with volumes provided by other major suppliers. In some cases, the United States has remained the primary supplier; in others, U.S. rice has been edged out by presumably more attractive offers from other suppliers. And, in some cases, no pattern is readily apparent—imports fluctuate from year to year, as do their sources.

U.S. Exports by Type

In 1973/74, U.S. exports of rice totaled 1.6 million tons. (U.S. exports in this section are on a milled basis, for crop years.) Approximately two-thirds, or 1.08 million tons, were regular white milled rice. The market for parboiled exports was just beginning to grow, hitting a record 346,000 tons. Exports of brown rice had slipped significantly from the previous year's half-million tons to just 165,000 tons.¹

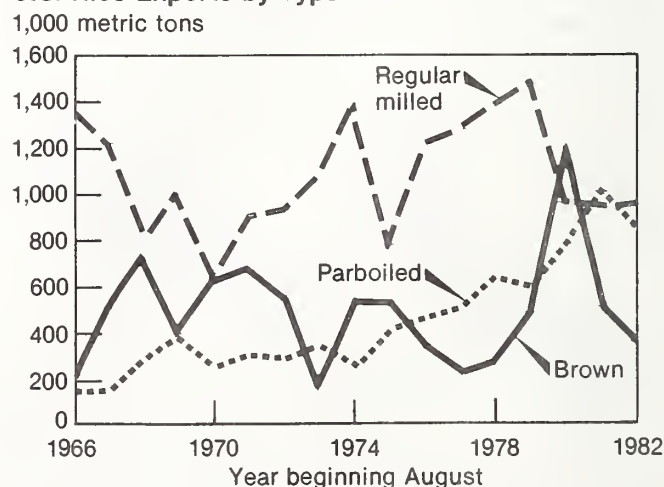
The biggest markets for U.S. rice in 1973/74 were South Vietnam, Kampuchea, South Korea, South Africa, and Saudi Arabia. (South Vietnam and Kampuchea were large markets because of P.L. 480 funding; they were not commercial markets.) Exports to these five countries totaled more than 800,000 tons—approximately 50 percent of total U.S. exports. Exports to South Vietnam

alone reached more than 300,000 tons, all of that regular white milled rice.

But the largest markets changed over time, as did the relative shares of regular milled, brown, and parboiled rice. With a change in government, by 1975/76 Kampuchea and South Vietnam were no longer markets for U.S. rice. Bangladesh moved into the number one spot, and several Middle Eastern countries, with new-found oil earnings, appeared among the top five markets. Parboiled rice exports rose to 23 percent of all rice exports, brown to 31 percent, and regular milled declined from two-thirds of exports in 1973/74 to less than half in 1975/76.

By 1980/81, total exports reached a record 3 million tons. Suffering from a very poor crop, South Korea took an unprecedented 1 million—one-third of the total exports that year. The share claimed by regular milled rice continued to decline—to 32 percent. Brown rice exports claimed 40 percent of all rice exported, and parboiled rice exports rose to 26 percent of total rice exports. Imports

U.S. Rice Exports by Type

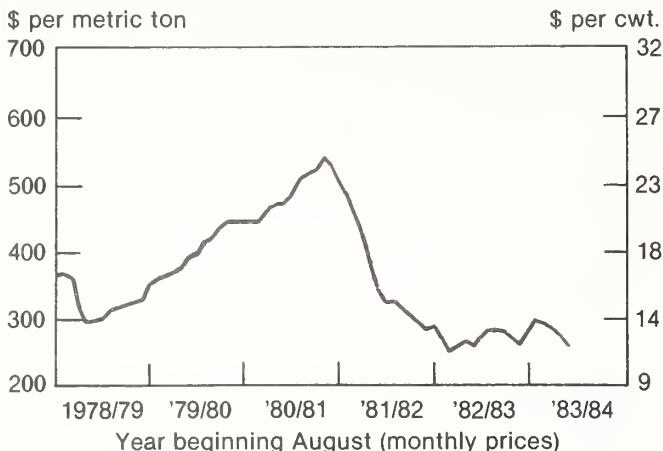


¹Precise data on exports of parboiled brown rice are not available; these exports may be included under the brown or parboiled rice categories.

Table 3.—U.S. exports of milled rice: Top five markets, crop years

| Country and rank | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 |
|--|------|------|------|------|------|------|------|------|------|------|
| <i>All rice</i> | | | | | | | | | | |
| South Vietnam | 1 | | | | | | | | | |
| Kampuchea | 2 | 4 | | | | | | | | |
| South Korea | 3 | 1 | 2 | 5 | | | 1 | 1 | 2 | 3 |
| Saudi Arabia | 4 | | 4 | | 4 | 3 | 4 | 3 | 3 | 2 |
| South Africa | 5 | | 5 | 4 | | | | | | |
| Iran | | 2 | 3 | 1 | 2 | 1 | | | | |
| Bangladesh | | 3 | 1 | | | | | | | |
| Iraq | | 5 | | | | 5 | 2 | | 4 | 1 |
| Nigeria | | | | 3 | 3 | 4 | 5 | 2 | | 4 |
| Indonesia | | | | 2 | 1 | 2 | 3 | 4 | | |
| Italy | | | | | 5 | | | | 5 | |
| Peru | | | | | | | | 5 | | |
| Belgium-Luxembourg | | | | | | | | | | 5 |
| Percent of total rice exports | 50.3 | 68.4 | 46.5 | 55.6 | 58.0 | 48.3 | 52.4 | 61.4 | 52.0 | 46.4 |
| <i>Regular milled rice</i> | | | | | | | | | | |
| South Vietnam | 1 | | | | | | | | | |
| Kampuchea | 2 | 3 | | | | | | | | |
| South Korea | 3 | 5 | | | | | 1 | 3 | | |
| Indonesia | 4 | | | 2 | 1 | 2 | 3 | 1 | | 4 |
| Dominican Republic | 5 | | | | | | | | | |
| Iran | | 1 | 1 | 1 | 2 | 1 | | | 2 | |
| Bangladesh | | 2 | 2 | | 4 | | | | | 3 |
| Iraq | | 4 | 4 | 4 | 3 | 4 | 2 | 4 | 1 | 1 |
| India | | | 3 | | | | | | | |
| Zaire | | | 5 | | | | | | | |
| Haiti | | | | 3 | | | | | | |
| Liberia | | | | 5 | | | | | | |
| Ivory Coast | | | | | 5 | 5 | | | | |
| Peru | | | | | | 4 | 5 | 2 | | 2 |
| United Arab Emirates | | | | | | | 4 | | | |
| Nigeria | | | | | | | | 5 | | |
| Saudi Arabia | | | | | | | | | 3 | |
| Canada | | | | | | | | | 4 | 5 |
| Madagascar | | | | | | | | | 5 | |
| Percent of total regular milled rice exports | 67.6 | 74.3 | 68.7 | 77.8 | 74.6 | 65.8 | 68.8 | 45.8 | 52.3 | 51.6 |
| <i>Brown rice</i> | | | | | | | | | | |
| Canada | 1 | 2 | | 3 | 4 | | 4 | 3 | 3 | 3 |
| Netherlands | 2 | 5 | 4 | 4 | | | | 5 | 5 | 5 |
| West Germany | 3 | | | | 3 | | | | | |
| South Africa | 4 | | | | | | | | | |
| Japan | 5 | | | | | | | | | |
| South Korea | | 1 | 1 | 1 | | 2 | 1 | 1 | 1 | 1 |
| United Kingdom | | 3 | | | | 3 | | | | |
| Bangladesh | | 4 | 2 | | | | | | | |
| Portugal | | | 3 | 2 | | 1 | 5 | | | |
| Italy | | | 5 | | | 4 | | | | |
| Indonesia | | | | 5 | 2 | | | | | |
| Switzerland | | | | | 5 | 5 | 3 | 4 | 4 | |
| Belgium-Luxembourg | | | | | | | 2 | 2 | 2 | 2 |
| Iraq | | | | | | | | | | 4 |
| Percent of total brown rice exports | 60.0 | 93.5 | 73.9 | 64.8 | 73.5 | 61.5 | 86.0 | 94.7 | 89.5 | 91.3 |
| <i>Parboiled rice</i> | | | | | | | | | | |
| Saudi Arabia | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 2 | 1 |
| South Africa | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| West Germany | 3 | 3 | 3 | 4 | 4 | | | | | |
| Liberia | 4 | 5 | 4 | | 5 | 4 | 4 | 4 | 4 | 4 |
| Canada | 5 | | | | | | | | | |
| Bangladesh | | 4 | | | | | | | | |
| North Yemen | | | 5 | | | | | | | |
| Nigeria | | | | 1 | 2 | 2 | 2 | 2 | 1 | 2 |
| Switzerland | | | | 5 | | 5 | 5 | 5 | 5 | 5 |
| Percent of total par-boiled rice exports | 69.6 | 76.4 | 76.5 | 77.6 | 83.6 | 81.8 | 75.8 | 82.5 | 83.0 | 78.0 |

Milled Rice: Thailand Export Prices*



*White 5% broken, f.o.b. Bangkok.

by the Organization of Petroleum Exporting Countries (OPEC) rose. Nigeria became the second largest U.S. rice market; the Middle East remained a strong market, and Indonesia slipped to fourth place as P.L. 480 funding for that country declined. In 1980/81, the top five markets took 61 percent of all U.S. rice exports.

Without significant purchases by Nigeria and much reduced purchases by South Korea during 1982/83, U.S. exports crashed back to 2.2 million tons—the lowest since 1977/78. Of the total rice exported, 16 percent was brown rice, 43 percent regular milled, and 38 percent parboiled. South Korea remained one of the top five markets, and Saudi Arabia and Iraq took a combined record total of 558,000 tons. Together, exports to Iraq and Saudi Arabia claimed one-fourth of the 2.2 million tons of U.S. rice exported in 1982/83.

Since 1973/74, 19 countries have at one time or another been among the largest markets for U.S. regular milled rice exports. Not one of these countries has been among the top five markets in each year during the decade. Iraq has been the most reliable market, showing up in 9 of the last 10 years.

Fourteen countries have shared the top five positions for brown rice exports since 1973/74. In 7 of the last 10 years, South Korea was the most reliable, as well as the largest, market for U.S. brown rice. Canada is the second most reliable market, placing among the top five markets in 8 of 10 years.

But in the parboiled rice market, only nine different countries have been among the largest five markets. Saudi Arabia and South Africa have been top markets every year since 1973/74. Liberia has also remained a reliable market for this type of rice.

Foreign Demand

This section looks at import activity of a few major buyers of rice in the world market over the past decade—especially key importers of U.S. rice. Has their overall demand diminished, or have these importers been lured away from U.S. rice to a more attractive exporter?

The key markets include: South Korea, Indonesia, Liberia, Nigeria, South Africa, and Saudi Arabia. These markets have, at one time or another, been among the major importers of U.S. rice. To appreciate their importance to the U.S. rice industry, it is worthwhile to consider their overall demand for rice over the past decade. As shown in the following tables, some importers have in fact reduced their total imports of rice, while others have shifted to other exporters.

Four major suppliers have provided Saudi Arabia with most of its rice imports, which grew from 200,000 tons in 1970 to 470,000 in 1982. (Imports in this section are on a milled basis, for calendar years.) As Saudi rice imports have more than doubled since 1970, the U.S. share has more than kept pace. In 1971, the United States supplied Saudi Arabia with 25 percent of its imports; by 1982, the share grew to 54 percent. In 1970, Thailand dominated the Saudi rice market, shipping 95,000 tons. But Thailand's market share has declined, and in 1982 Thai exports totaled less than a fifth of the U.S. share, at just 48,000 tons. Pakistan is the second largest supplier of Saudi imports, shipping nearly 90,000 tons of aromatic rice in 1982.

Saudi Arabia is a strong market for U.S. long grain parboiled rice, taking nearly a third of all U.S. parboiled rice exports annually. Despite the huge decline in U.S. exports since 1980/81, demand by Saudi Arabia for rice—particularly U.S. rice—has not diminished, nor has Saudi demand shifted in favor of competitors.

Nigeria is another market where rice demand has skyrocketed over the past decade. In 1970, Nigeria imported 541 tons of rice. By 1983, after a decade of benefiting from high oil export revenues and foreign exchange borrowings, however, imports rose to more than 700,000 tons. Thailand and the United States have been Nigeria's primary suppliers. Thailand did not become a significant supplier until 1976, however.

In 1976, Nigeria imported roughly the same amount of rice from Thailand as the United States. From 1976 until 1981, Nigeria imported more Thai than U.S. rice. But in 1981, the U.S. market share nearly doubled Thailand's. Apparently, the U.S. market edge was short-lived: In 1983, Thailand shipped more than a half-million tons of rice to Nigeria, while U.S. exports plunged to 124,000 tons, less than half the year-earlier level. Nigeria found itself with foreign exchange problems resulting from a loss in petroleum earnings and an inability to acquire more international credit. A more attractive offer for comparable quality rice from Thailand shut out U.S. exports.

Liberia is a rice market that appears basically untapped, except by U.S. exporters. Liberian imports grew from 49,000 tons in 1970 to 95,000 in 1981 (the latest year for which data are available). This doubling of imports has virtually all been met by the United States, approximately half of that by P.L. 480 shipments.

South Africa, a commercial market dominated by U.S. rice, has also attracted some attention from Uruguay in recent years. In 1970, South Africa imported 68,000 tons of rice, and 63,000 of that came from the United States. In 1982, the United States supplied 120,000 tons of South Africa's total rice imports of 146,000 tons. In the past 3 years, however, Uruguay has stepped up shipments to South Africa, from 100 tons in 1978 to 13,000

in 1982. In 1983, Thailand also supplied South Africa with 30,000 tons of its growing rice imports.

Indonesia is one of the world's largest rice importers, or has been until the past 2 years. Indonesian imports averaging 1 to 2 million tons a year are not unusual, and Thailand is one of the largest suppliers. Indonesia has been a strong market for U.S. rice, taking 200,000 to 300,000 tons in many earlier years, or about 10 to 15 per cent of its total rice imports.

In the case of Indonesia, however, all suppliers lost ground in 1981 and 1982 as Indonesia benefited from record rice crops. Indonesian imports dropped from 2 million tons in 1980 to half a million in 1981; in 1982, imports fell again, to 330,000 tons. Japan shipped 200,000 tons in 1980, less than half of that in 1981, and nothing in 1982. Pakistan's shipments fell nearly 75 per cent from 1981 to 1982. Thailand, which had shipped nearly 700,000 tons in 1980, sold only 195,000 in 1981 and less than 160,000 in 1982. U.S. rice exports plummeted from 220,000 in 1980 to 76,000 in 1981 and then to just 2,500 tons in 1982. Only Burma and Taiwan improved positions: Imports from Burma fell from 113,000 tons in 1980 to 27,000 in 1981, but recovered to 73,000 in 1982. Likewise, imports from Taiwan crashed from three-quarters of a million tons to 43,000 in 1981, but increased to 87,000 in 1982.

Finally, look at the rice market for South Korea—one of the recent disappointments for U.S. exporters. The numbers do not justify expectations that South Korea is

a consistent 1-million-ton rice market. In half the years since 1970, South Korea has imported less than 300,000 tons on an annual basis. Moreover, rice import demand by South Korea varies with domestic output, exhibiting neither the steady growth that markets in Africa or the Middle East have shown, nor the usually near-constant demand levels of Indonesia, for example. Rather, import demand gyrates severely, jumping 500,000 to 1 million tons in a year. The United States is traditionally the preferred supplier because of its large, available, medium grain rice. However, when Japanese food aid is available or when demand rises dramatically, as it did in 1981, purchases are made from several countries.

Looking at exports by type and markets, as well as imports of key countries, it appears that prices are likely a factor affecting some losses of otherwise strong U.S. rice markets. Nigeria is one example. Rice imports by Nigeria have not fallen, rather Nigeria has shifted purchases to Thailand. Parboiled rice markets, such as Liberia and Saudi Arabia, on the other hand, are apparently less sensitive to the premium prices charged for U.S. parboiled rice. Their import demand has continued to increase, and the United States remains the primary supplier. As for South Korea, import demand is more likely a direct function of crop conditions and storage capacity. The same is true for Indonesia, assuming food aid is available. Thus, good harvests diminish the need for imports. But these markets also appear to be more price conscious than the Middle East, or a P.L. 480 market like Liberia.

Table 4.—Milled rice imports by country of origin

| Republic of Korea | | | | | | | | |
|-------------------|---------------|---------|----------|----------------|----------|----------|-----------|-----------|
| Calendar year | United States | Japan | Thailand | Western Europe | Africa | Other | Total | |
| Metric tons | | | | | | | | |
| 1970 | 250,925 | 3,257 | 26 | 0 | 0 | 9 | 254,217 | |
| 1971 | 397,282 | 452,248 | 5,103 | 0 | 0 | 35,389 | 890,022 | |
| 1972 | 500,004 | 78,942 | 18,299 | 0 | 9,500 | 0 | 606,745 | |
| 1973 | 245,253 | 54,180 | 559 | 0 | 0 | 0 | 299,992 | |
| 1974 | 251,607 | 82,119 | 170 | 0 | 0 | 5,003 | 338,899 | |
| 1975 | 414,868 | 0 | 11,053 | 0 | 0 | 76 | 425,997 | |
| 1976 | 155,535 | 0 | 2,429 | 0 | 0 | 0 | 157,964 | |
| 1977 | 54,027 | 0 | 3,433 | 0 | 0 | 53 | 57,513 | |
| 1978 | 0 | 0 | 1,864 | 0 | 0 | 0 | 1,864 | |
| 1979 | 125,490 | 220,000 | 9,898 | 0 | 0 | 0 | 355,388 | |
| 1980 | 668,233 | 142,857 | 10,500 | 0 | 0 | 0 | 821,590 | |
| 1981 | 1,088,100 | 619,300 | 119,000 | 84,950 | 51,000 | 1329,300 | 2,291,650 | |
| 1982 | 228,003 | 0 | 0 | 0 | 0 | 0 | 228,003 | |
| Indonesia | | | | | | | | |
| | United States | Burma | Japan | Taiwan | Pakistan | Thailand | Other | Total |
| 1970 | 444,824 | 80,844 | 151,983 | 0 | 0 | 132,548 | 145,430 | 955,629 |
| 1971 | 233,641 | 42,192 | 105,124 | 0 | 0 | 121,925 | 0 | 502,882 |
| 1972 | 287,502 | 2,000 | 104,830 | 8,800 | 23,441 | 184,256 | 137,182 | 748,011 |
| 1973 | 158,119 | 19,575 | 254,702 | 31,845 | 295,388 | 281,047 | 592,968 | 1,633,644 |
| 1974 | 69,243 | 78,427 | 107,272 | 0 | 106,040 | 128,630 | 584,304 | 1,073,916 |
| 1975 | 0 | 60,922 | 29,856 | 0 | 52,273 | 11,530 | 566,286 | 668,594 |
| 1976 | 239,628 | 228,694 | 0 | 0 | 52,273 | 514,461 | 257,997 | 1,293,053 |
| 1977 | 367,799 | 160,923 | 0 | 127,100 | 65,148 | 854,544 | 412,465 | 1,988,979 |
| 1978 | 382,089 | 115,943 | 88,000 | 227,667 | 95,019 | 192,771 | 722,066 | 1,823,555 |
| 1979 | 243,537 | 148,635 | 139,423 | 378,432 | 49,892 | 612,439 | 361,567 | 1,933,925 |
| 1980 | 220,765 | 113,499 | 209,209 | 266,705 | 0 | 694,900 | 534,850 | 2,039,928 |
| 1981 | 76,625 | 26,780 | 92,612 | 43,506 | 39,484 | 194,987 | 68,800 | 542,794 |
| 1982 | 2,500 | 73,205 | 0 | 87,482 | 10,516 | 158,526 | 200 | 332,429 |

Continued—

Table 4.—Milled rice imports by country of origin —Continued

| Saudi Arabia | | | | | | |
|--------------|---------------|-----------|----------|-----------|--------|---------|
| | United States | India | Pakistan | Thailand | Other | Total |
| 1970 | 68,674 | 133,360 | 10,612 | 95,383 | 13,998 | 202,027 |
| 1971 | 51,226 | 5,395 | 43,340 | 82,717 | 17,663 | 200,341 |
| 1972 | 79,581 | 11,829 | 28,959 | 26,850 | 3,691 | 150,910 |
| 1973 | 70,502 | 0 | 19,345 | 47,596 | 4,084 | 141,527 |
| 1974 | 90,185 | 2,959 | 31,126 | 70,074 | 8,342 | 202,686 |
| 1975 | 80,171 | 8,350 | 47,540 | 49,305 | 3,537 | 188,903 |
| 1976 | 116,434 | 16,135 | 56,908 | 102,017 | 8,395 | 299,889 |
| 1977 | 80,447 | 5,213 | 43,471 | 13,241 | 19,113 | 161,485 |
| 1978 | 253,114 | 7,575 | 76,594 | 45,334 | 21,452 | 404,069 |
| 1979 | 180,039 | 12,472 | 84,257 | 37,174 | 26,965 | 340,907 |
| 1980 | 188,430 | 18,273 | 87,689 | 37,632 | 24,101 | 356,125 |
| 1981 | 249,743 | 10,455 | 104,302 | 32,571 | 30,013 | 427,084 |
| 1982 | 255,589 | 44,467 | 87,956 | 48,200 | 34,830 | 471,042 |
| Nigeria | | | | | | |
| | United States | EC-10 | Thailand | Other | | Total |
| 1970 | 0 | 537 | 0 | 4 | | 541 |
| 1971 | 4,452 | 587 | 252 | 369 | | 5,660 |
| 1972 | 489 | 9,996 | 500 | 34 | | 11,019 |
| 1973 | 335 | 29 | 0 | 2,209 | | 2,393 |
| 1974 | 3,412 | 140 | 0 | 399 | | 3,951 |
| 1975 | 5,565 | 24 | 0 | 11 | | 5,600 |
| 1976 | 46,285 | 559 | 46,393 | 366 | | 93,603 |
| 1977 | 157,969 | 5,452 | 277,924 | 4,365 | | 445,710 |
| 1978 | 256,112 | 15,174 | 482,760 | 35,077 | | 789,123 |
| 1979 | 42,572 | 107 | 198,422 | 493 | | 241,594 |
| 1980 | 189,831 | 179 | 197,473 | 6,649 | | 394,132 |
| 1981 | 402,078 | 125 | 211,050 | 72,608 | | 685,861 |
| 1982 | 357,950 | 0 | 282,687 | 24,909 | | 665,546 |
| 1983 | 124,072 | 0 | 567,637 | 20,167 | | 711,876 |
| South Africa | | | | | | |
| | United States | Argentina | Uruguay | Australia | Others | Total |
| 1970 | 62,832 | 659 | 0 | 0 | 4,507 | 67,998 |
| 1971 | 75,044 | 2,463 | 0 | 142 | 4,054 | 81,703 |
| 1972 | 66,543 | 103 | 0 | 2,204 | 6,601 | 75,451 |
| 1973 | 66,432 | 395 | 428 | 5,334 | 19,226 | 91,815 |
| 1974 | 52,894 | 1,052 | 434 | 2,845 | 7,305 | 64,530 |
| 1975 | 70,506 | 54 | 206 | 3,352 | 5,050 | 79,168 |
| 1976 | 72,320 | 437 | 481 | 1,204 | 6,465 | 80,907 |
| 1977 | 88,436 | 1,599 | 367 | 3,767 | 4,459 | 98,628 |
| 1978 | 77,959 | 5,205 | 109 | 3,631 | 5,304 | 92,208 |
| 1979 | 99,876 | 3,401 | 1,028 | 1,026 | 15,822 | 121,153 |
| 1980 | 87,179 | 799 | 14,682 | 621 | 9,083 | 112,364 |
| 1981 | 109,001 | 1,487 | 11,733 | 228 | 11,598 | 134,047 |
| 1982 | 120,571 | 671 | 13,369 | 418 | 11,287 | 146,316 |
| Liberia | | | | | | |
| | United States | EC-10 | Egypt | Thailand | Others | Total |
| 1970 | 44,487 | 23 | 3,444 | 0 | 1,056 | 49,010 |
| 1972 | 38,185 | 267 | 15,454 | 0 | 233 | 54,139 |
| 1973 | 40,838 | 2 | 919 | 0 | 27 | 41,786 |
| 1974 | 29,150 | 90 | 0 | 0 | 16,782 | 46,022 |
| 1975 | 32,159 | 531 | 0 | 0 | 1,810 | 34,500 |
| 1976 | 28,193 | 1,633 | 0 | 0 | 815 | 30,641 |
| 1977 | 33,657 | 955 | 72 | 0 | 2,782 | 37,466 |
| 1978 | 55,159 | 71 | 272 | 0 | 4,307 | 59,809 |
| 1979 | 56,277 | 3,030 | 0 | 0 | 1,640 | 60,947 |
| 1980 | 49,960 | 0 | 0 | 7,806 | 15,492 | 73,258 |
| 1981 | 69,671 | 1,839 | 0 | 0 | 14,825 | 86,335 |
| 1982 | 95,163 | 1 | 0 | 0 | 248 | 95,412 |

¹Australia—114,600; Taiwan—40,500; Indonesia—75,000. Compiled from reports of FAS.

Some Pieces of the World Rice Puzzle

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Abstract: The world rice market is known as a “thin” market, evidenced by a small volume of trade in comparison to production, limited buyers and sellers, and relatively unpredictable demand. These can lead to abrupt price variations over a short period. Key items are defined that identify the world market boundaries—by types, class, and quality of rice.

Keywords: Rough, milled, parboiled, brown, japonica, indica, aromatic, glutinous rice.

Rice is more important as a staple food for most of the world than it is in world commerce. In the World Bank's Commodity Trade and Price Trends, rice ranks 14th in importance among agricultural commodities traded, and yet 40 percent of the world depends on rice for more than 80 percent of their diet. In 1983, the Food and Agriculture Organization (FAO) estimated the value of world rice trade at \$3.5 billion. But among developing countries, rice is a leading traded commodity. Of the \$3.5 billion of 1983 rice trade, \$2.2 billion came from trade of developing countries.

The world market for rice is characterized as “thin”—as evidenced by the small volume of trade compared with production, limited buyers and sellers, and the relatively unpredictable level as well as source of demand. The consequences of this thinness are uncertainty and instability that can produce significant short-term price variations.

All Rice Is Not Created Equal

Despite nearly 2 billion people depending on rice for over 80 percent of their diet, the world rice market often appears to be a complicated puzzle—with each new piece of information triggering a chain reaction. With a limited number of traders in the world market, one unexpected or new buyer can have dramatic consequences on trade, and hence, on prices. The same is true for a sharp downturn in demand of a key importer or with an unexpected seller, caught suddenly with large exportable supplies on hand and inadequate storage.

This vital market's volatility is exaggerated as the trade is stratified according to rice types. When it comes to trade, tastes and preferences can nearly rival price as key buyer considerations. Some countries would cut consumption of rice rather than consume a kind of rice to which they are unaccustomed. Because of the market's overall “thinness,” it is important to understand how the rice market is segmented. This article defines key terms that play significant roles in determining rice import demand. These market boundaries—by type, class, and quality of rice—mean that particular import demand is often satisfied only by certain origins.

Rough Versus Milled

The terms “rough,” “brown,” and “milled” rice refer to stages in the milling process. Rough rice, or paddy, is the farm product right after harvest, and still contains the hull and bran layers. Very little rough rice is traded internationally because the relatively low value of the hulls make shipments uneconomical over long distances.

When rough rice is milled and the hull is removed, brown rice is produced. If the bran is removed, milled or white rice is produced. Precise data are not available, but about only 1 to 1.5 million tons of brown rice are traded annually. The principal markets for brown rice, usually traded in bulk, are South Korea, Portugal, the European Community (EC), Canada, and South Africa. Many of these importers purchase brown rice not as final product, but for further processing and exports.

The latter three of these markets import parboiled brown rice. Parboiling may also be part of the milling process. When rough rice is brought to the mill, it is steamed before the hull or bran is removed. This forces the nutrients in the hull and bran to converge on the inner kernel of rice. Brown and rough rice probably account for about 15 percent of the total annual volume of world rice trade; the majority of rice traded is milled.

World Rice Types

There are basically four types of rice: Glutinous, aromatic, japonica, and indica. They are distinguished by their starch content and their qualities once cooked—such as tenderness and stickiness of the grains.

Glutinous rice is also known as waxy or sweet rice and contains very low amylose (starch composition). When cooked, it forms a gelatine-like mass without distinct grain separation. Most rice-consuming areas in Asia produce small amounts of glutinous rice for use in desserts, ceremonial foods, and sweet dishes. In northeast Thailand and Laos, however, it is the staple food. Thailand is the principal trader of glutinous rice, and less than 100,000 tons of glutinous rice are usually traded worldwide. It is generally sold at a discount to nonglutinous

rice with the same amount of broken. Indonesia, Laos, Japan, and China are the principal importers.

Aromatic, or scented, rice is grown mostly in the Punjab area of central Pakistan and northern India and is often referred to as basmati rice. When cooked, basmati grains double in length, remain completely separate, and have a distinctive odor. Traded volume is light—about 300,000-400,000 tons annually—and is usually sold at prices roughly twice that of high-quality long grain rice. Higher income Middle Eastern countries are the major buyers of basmati rice. Small quantities are also grown in Thailand and sold to Hong Kong and Singapore.

Japonica rice has a fairly low amylose content, is semi-sticky and moist when cooked. A round-shaped grain, japonica rice grows in Japan, the Koreans, Taiwan, part of China, Australia, the Mediterranean area, Brazil, and California—where it is called short or medium grain rice. Demand for this rice is limited, mostly because of its cooking characteristics. The average volume annually traded totals about 1.5 million tons. Since a significant quantity of japonica must often be exported into indica rice markets, japonica-type rice normally sells at a discount to indica. The principal importers are Indonesia and South Korea.

Indica rice is a long grain rice grown principally in China, south and southeast Asia, and the southern United States. Indica has a medium-to-high amylose content, and cooks up fluffy, with good volume expansion and grain separation. The bulk of world rice trade is indica. But again the world market is fragmented. The world indica market is composed of a demand for regular milled and parboiled rice, and defined by quality based on percentage of broken, translucency of the grain, chalkiness, and uniformity. Just as there is little substitution between japonica and indica, there is little also between regular milled and parboiled rice.

Milled Versus Parboiled Rice

Parboiled rice is traded in two distinct markets depending on its quality. Some rice kernels are invariably broken in milling, and the amount of broken kernels is a criterion in judging rice quality. The higher the percentage, the lower the quality and price. More importantly, low-quality parboiled rice has a dark color and a strong odor. Burma and Thailand are the principal exporters, with most imports of this low-quality parboiled rice going to Sri Lanka, Bangladesh, and Liberia. The price for low-quality rice is about the same as that for broken rice.

High-quality parboiled rice, on the other hand, has a yellowish tinge, no odor, and little foreign matter. The United States and Thailand are the major producers of high-quality, non-odorous parboiled rice. Saudi Arabia and Nigeria are the largest importers. The EC, Canada, and South Africa also import significant quantities, but generally of brown parboiled rather than milled. In the United States, high-quality parboiled rice generally sells at a premium price to high-quality regular milled rice. However, the reverse is true in Thailand: High-quality parboiled sells at a discount.

High-quality, regular milled long grain rice has less than 10 percent broken and is exported principally by the United States and Thailand. In world trade, the most frequently cited benchmarks of high-quality, regular milled rice are the U.S. number 2, 4-percent long grain, and the Thai 100-percent, Grade B. Demand is concentrated in the United States, Western Europe, Uruguay, Argentina, Iran, and Iraq. Although most consumers in south and southeast Asia prefer high-quality, long grain rice, only Malaysia, Singapore, and Hong Kong are significant buyers.

The United States, Thailand, and Pakistan are principal exporters of medium-quality, regular milled long grain rice (10-20 percent broken). Import demand is concentrated in Brazil, Hong Kong, Malaysia, Indonesia, and the Soviet Union.

Low-quality, milled long grain (more than 20 percent broken) is primarily exported by Thailand, Pakistan, China, and Burma. The largest single importer of this rice is Indonesia, but most of west Africa also imports it.

Of all milled rice, broken are generally considered the lowest quality. They are purchased by countries that mill rice by hand-pounding, or by those with severely constrained foreign exchange. However, some countries such as the United States also use broken for beer-brewing. Thailand and Burma are the primary suppliers of broken, and the largest buyers in recent years have been Senegal (where broken are actually the preferred grain), Madagascar, Mauritania, Gambia, and South Vietnam.

Prices and Policies

Besides the diversity in the types of rice traded, the world rice market is complicated by the lack of commonly used grades and standards, despite the understood definitions of high-, medium-, and low-quality rice. Along with the uncertainties over sources of demand and supply, and the small volume of rice traded, there is no single "world market" price for rice. The price of rice depends on the specific quality characteristics of the rice. And because consumer preferences can exert a powerful influence over demand, prices for different types or qualities move somewhat independently of each other based on the supply-demand factors for that market.

There is no globally recognized central spot or futures market for rice comparable to the Chicago Board of Trade, although a futures market has recently opened on the Mid-America Exchange after the New Orleans Commodity Exchange closed in 1983. Prices posted weekly by the Thai Board of Trade are commonly cited as the "world price," but these prices are often as much as 10 percent above the actual trading price. Furthermore, comparable quality rice from a different origin may be sold at a discount or premium to Thai rice, depending upon local supply and demand and relative proximity to the ultimate destination. Without an effective futures market for rice, trade is conducted without hedging and international traders are likely to incur large profits or losses. Hard data on trading margins for rice are lacking, but evidence suggests they are sharply above those enjoyed in the much larger wheat and coarse grain markets. A handful of trading houses in New York, Geneva, and Paris conduct most of the rice trade.

Policy also defines the world rice market, with governments playing an important and increasing role. In many developing countries, it is politically paramount that the government assure sufficient rice supplies, particularly in urban areas. This often conflicts with another objective: providing for the welfare of the rice farmers, who account for a significant percent of the population. The result is that both domestic trade and rice importing are usually either tightly controlled or directly conducted by the government. Typically, a government attempts to purchase all locally-produced rice (in milled or rough form) that meets its standards at a specified support price. Government stocks of domestically produced or imported rice are then used to assure stable retail prices, and especially to prevent retail prices from rising above a predetermined level.

Government involvement is becoming more pervasive. Of the estimated 12.1 million tons of rice traded in 1983, governments imported over 7.2 million tons—60 percent. Both rice imports and exports are often subject to licensing, quotas, or other forms of government control. Of all rice exported in 1982, governments exported an estimated 4.8 million tons. In 1983, government exports totaled 5.6 million tons—46 percent of all rice exported. In fact, it is getting easier to count those producing countries where exports are left to the private trade: The United States, Australia, Italy, Argentina, Uruguay, and Spain. Even in Thailand, the government sold nearly 1.4 million tons of rice in 1983. That amounted to 37 percent of Thailand's 1983 rice exports.

Government-to-government contracts are also of growing importance as a trade instrument. Over 2.5 million tons of the 5.8 million exported by Thailand, Pakistan, and Burma in 1983 were made using government-to-government arrangements. This is up nearly a fifth from 1982 because of increased imports by Indonesia and the Ivory Coast, which is buying more through government-to-government contracts. It is not clear if rice traded using government-to-government contracts in 1984 will reach 1983 levels. Although the Ivory Coast and Senegal recently purchased some 360,000 tons of rice from private exporters, Nigeria (which imported 700,000 tons of rice in 1983) has indicated that all new rice purchases will be made using government-to-government arrangements. According to the Food and Agriculture Organization (FAO), the use of long term agreements (LTA's) is also increasing. FAO estimates that such contracts rose from 800,000 tons in 1981 (6 percent of world trade) to 950,000 tons in 1982 (8 percent of world trade). In 1983, the amount of rice traded under LTA's is estimated to have fallen to 700,000 tons due to a drop in shipments from India to the USSR. It

may be several years before overall volumes return to the levels of 1981 and 1982.

Strong government presence in international rice commerce often heightens the price instability of the world rice market. Because the world rice market is perceived as unstable, where rice is the staple, most governments try to pursue policies of self-sufficiency. They do this by limiting rice imports, and by encouraging the use of high-yielding varieties and fertilizer through subsidized prices, or by extending short-term credit. Governments may also hold large stocks of rice to ensure adequate supplies during the marketing year, and to compensate for years with disappointing harvests. Rather than improve the supply-demand situation, however, this action often worsens the market instability by reducing the volume traded. In addition, to assure adequate supplies and achieve self-sufficiency every year, many governments overcompensate in trying to achieve appropriate stock levels. Difficulties arise if storage is insufficient; surplus rice can be exported only with a hefty subsidy. The subsidy is needed because the rice must often be sold at a discount because buyers are unsure of its quality. Furthermore, most countries who find themselves in this position also have an infrastructure more suited to importing rice than exporting it. Buyers question whether rice will be available at the port when the ship arrives, and are thus reluctant to incur the extra costs of delayed vessel loadings.

Equally important, most governments treat the international rice market as a residual market. As a result, the quantity of rice imported by a given country may vary sharply from year to year. Similarly, trade patterns—sources of supplies—can also vary radically from year to year.

Finally, government buying agencies are often slow to anticipate needs, and equally slow to act on those needs. Therefore, when decisions are made to purchase rice, it is usually for rice that was needed yesterday.

All of these factors—diversity of acceptable product, rigid infrastructure, lack of a central world market, uncertainty about the sources of demand and supply, and the inexact adjustments governments make to meet desired levels of supply, demand, stocks, and prices—result in high search costs for information regarding current prices and short-term import needs and the availability of a particular quality of rice. Such information is tightly held, and hence, particularly important for rice because there is no effective price discovery mechanism, and because the information in developing countries (the primary importers) is generally inadequate.

Cross-Hedging Rice Bran and Millfeed

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Abstract: Cross-hedging rice bran and millfeed was evaluated using corn, oats, wheat, and soybean meal futures. Examples are presented of simple and multiple cross-hedges. Based on a simulation analysis, the risk associated with cross-hedging could be reduced up to 42 percent for rice bran and up to 24 percent for rice millfeed.

Keywords: Rice, byproducts, cross-hedge, futures, risk reduction.

Rice bran and millfeed prices vary a lot within and across marketing years. In September 1980, for example, Arkansas rice bran cost \$92.50 a ton while rice millfeed cost \$46.50 a ton. By January 1981, rice bran increased to \$110 a ton and millfeed to \$65 a ton. Then in April, bran fell to \$67.50 a ton, and millfeed to \$22.50 a ton. By September 1981, bran had decreased to \$58.50 a ton and millfeed to \$24.50 a ton, an annual decrease of 37 and 47 percent, respectively.

This price variability creates substantial risk for rice millers. Without a futures market for millfeed products, rice millers must protect output prices in other ways. One alternative is to forward contract with feed mixers who use millfeed as ingredients, or with livestock feed users. Even so, forward contracting opportunities without price concessions are limited, and there is always a question of whether commitments will be met by the buyer. Another alternative is cross-hedging bran and millfeed output using futures markets for other commodities. This article examines the potential for simple and multiple cross-hedging of rice bran and millfeed.

Cross-Hedging Mechanics

By definition, cross-hedging is the pricing of a cash commodity position by using futures for different commodities (Hieronymus). There are two types of cross-hedges, simple and multiple. Simple cross-hedging uses futures of one commodity to offset a cash position, and multiple cross-hedging uses two or more different commodities.

Cross-hedging is more complicated than direct hedging. First, the appropriate futures commodity or commodities for cross-hedging must be selected. Potential cross-hedging vehicles must be substitutes or complements in the production or marketing process. Because rice bran and millfeed are used primarily in cattle and poultry rations, futures prices for other feed ingredients such as corn, oats, soybean meal, and wheat seem appropriate cross-hedging choices. Although wheat is mainly a food

grain, it is also used as feed when feed grain prices are high relative to wheat.

Second, the size of the futures position to be taken must be determined. The appropriate size can be found using regression analysis of cash prices on futures prices. The coefficients from this regression represent the number of bushels required to cross-hedge a given cash position. The first four columns of table 5 show the results from these regressions. Only the "best" simple and "best" multiple cross-hedges are shown; these are defined as the lowest mean-squared forecast error (MSFE) of net-about-target price. The data used to develop these results were the mid-month cash bran and millfeed prices for Arkansas, California, Louisiana, and Texas; the corn, oats, wheat, and soybean meal futures prices are from the Chicago Board of Trade. The futures prices are closing prices for the trading day nearest the 15th of the month and are always for the contract nearest to maturity. The data included observations from January 1972 through December 1982.

The best simple cross-hedge for Arkansas bran uses a position of 18.94 bushels of corn futures per ton of bran (table 5). Because the coefficient is positive, a long cash position would involve a short futures position and vice versa. Multiple cross-hedging a ton of Arkansas rice bran requires an offsetting position of 15.73 bushels of corn futures and 2.52 bushels of wheat futures. The position in futures is not always opposite the cash position (that is, long cash and short futures, or vice versa). For example, the best multiple cross-hedge for Louisiana bran requires a futures position in oats in the same direction as the cash position. To cross-hedge a ton of Louisiana rice bran requires the purchase (sale) of 9.80 bushels of oats futures per ton of rice bran owned (sold forward).

A third complication in cross-hedging is determining the "generalized basis" (Anderson and Danthine). The generalized basis is similar to a traditional basis in that it represents some average difference between cash and futures, or in the case of a multiple cross-hedge, a set of futures prices. The primary distinction is that each futures price is weighted by the number of bushels of that particular futures required to cross-hedge one ton of byproduct (whereas in textbook hedging the single futures used as a hedge is given a weight of one).

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According to table 5, the generalized basis or average January difference between the price of a ton of Arkansas bran and the price of 18.94 bushels of corn futures, is \$34.58. The generalized basis decreased to a low of \$9.60 in May and rose from there to a peak of \$36.98 in December. For the multiple Arkansas bran cross-hedge, the generalized basis (or average difference between the January price of one ton of Arkansas bran and the price of 15.73 bushels of corn futures and 2.52 bushels of wheat futures) is \$33.56. The generalized basis figures in the table are used for projecting cash prices based on current futures quotations. In hedging language, this is referred to as a target price.

Simple Cross-Hedge

The mechanics of simple and multiple cross-hedging can best be illustrated by example (tables 6 and 7, respectively). Assume it is mid-June 1981. An Arkansas rice miller expects rice bran prices will be much lower by mid-September. Currently, rice bran is trading at \$81.50 a ton. To avoid the expected price decline, the rice miller decides to cross-hedge a 3-month forward production with a simple cross-hedge using corn futures. To determine what price the futures market is offering for 3-month forward production, the miller must set a target price—the price he expects to receive by cross-hedging. To do this, the miller needs to know four things:

- (1) number of bushels of corn futures (18.94) required to cross-hedge one ton of Arkansas bran;
- (2) mid-June price of September corn futures (\$3.58 a bushel);
- (3) September generalized basis (\$16.60 a ton); and,
- (4) futures transactions cost, assumed here to be 1 cent a bushel.

The target price is the product of (2) minus (4) and (1) added to (3) $(3.58 - 0.01) \times 18.94 + 16.60$, or \$84.22 a ton. Because the rice miller's 3-month forward production is expected to be about 1,000 tons of bran, this would imply a short corn futures position of 18,940 bushels. The corn contract on the Chicago Board of Trade (CBT) is for 5,000 bushels, while the Mid-America Commodity Exchange (MACE) contract is for 1,000 bushels. The closest approximation to 18,940 bushels is 3 CBT contracts plus four MACE contracts, or 19,000 bushels. The bran cross-hedge transaction is shown in the first line of table 6.

By September, bran prices have fallen to \$58.50 a ton or \$23 a ton less than the mid-June price. As the rough rice is milled and the cash bran is sold, the short corn futures contracts are offset at a profit of 81 cents a bushel (table 6). This amounts to \$15.39 $(\$81 \times 19 \text{ bushels})$ for each ton of bran cross-hedged. Subtracting the futures transactions cost of 19 cents a ton, the net price is \$73.70 a ton $(15.39 - 0.19 + 58.50)$. Even though the Arkansas miller received \$10.52 less than had been projected in mid-June $(\$84.22 - \$73.70)$, the simple cross-hedge provided some \$15 a ton more than if he had not hedged and simply sold his bran in the cash market.

Multiple Cross-Hedge

To illustrate a multiple cross-hedge, again assume that it is mid-June 1981 and that an Arkansas rice miller is interested in pricing a 3-month forward byproduct output. The rice miller is selling the bran and hulls together as rice millfeed. From table 5, corn and oats futures are the appropriate cross-hedging media. Each ton of anticipated millfeed production calls for the sale of 13.67 bushels of corn futures and for the purchase of 11.04 bushels of oats futures. (Remember that for a cross-hedge against a long cash position, a positive sign implies a short futures position while a negative sign implies a long futures position.) By cross-hedging, the miller expects to receive \$35.16 a ton. The derivation of the target price is shown in the first line of table 7. Anticipating production of 3,000 tons of millfeed during September, a short corn futures position of 41,010 bushels and a long oats futures position of 33,120 bushels are needed. The closest futures contract multiples would be 8 CBT plus 1 MACE corn futures contract for 41,000 bushels of corn, and 6 CBT plus 3 MACE oats futures contracts for 33,000 bushels of oats.

By September, Arkansas millfeed prices have fallen to \$24.50 a ton from \$35 a ton in June. Per ton, the short corn futures position returns a profit of \$11.07 (13.647×81) while the long oats futures position returns a \$1.27 loss $(11.04 \times .115)$. Since approximately 25 bushels of futures are required to cross-hedge a ton of millfeed, the futures transaction cost is 25 cents a ton. Thus, the net price received per ton of millfeed cross-hedged is \$34.05 $(24.50 + 11.07 - 1.27 - 0.25)$. (The 1-cent-a-bushel discrepancy between the \$34.05 and the \$34.06 in table 7 results because only an approximate balance was found between the desired futures position and CBT and MACE futures contract multiples.) This is \$9.56 a ton more than the mid-September cash market price. The short corn and long oats futures position protected the miller from most of the decline in the cash millfeed price.

In the two cross-hedging examples, it should be noted neither achieved the exact target price. Seldom is a hedge perfect because cash and futures, or a combination of futures, rarely move together perfectly. To the extent that they do not move in equivalent per-ton dollar amounts, the hedge will be less than perfect and the target price will be more or less the final net price received.

Risk Reduction from Cross-Hedging

To determine the success of cross-hedging rice bran and millfeed, a simulation analysis was run. The data set was the same as used to derive the results in table 5. Again, January 1972 was the beginning date. Forty-eight observations were used to estimate the initial relationship between cash and a combination of the nearby futures prices for corn, oats, soybean meal, and wheat. In all, there were 15 combinations of the four commodities, thus leading to 15 different cross-hedges. Although alternative cross-hedging horizons from 1 to 12 months were simulated, only the results of 3-month cross-hedges are shown. The first 3-month forward cross-hedges were placed in December 1975. Each month thereafter, an observation was recorded, regressions were rerun, and a new set of cross-hedges placed. This process was continued until the final cross-hedges were lifted in December

1982. Because of some unquoted prices, the number of simulated cross-hedges per State during the 7-year period ranged from 71 to 80.

In practice, cross-hedging could be used by a rice miller to price bran and millfeed when prices are expected to fall. When prices are expected to rise, the cash market would be used. In this context, the practical usefulness of cross-hedging depends upon the extent to which the net price and target price differ. Two measures of price difference were calculated: (1) the average forecast error (AFE), which is the average difference between net and target price; and (2) MSFE, which is the average of the squared differences between net and target price. Only simple and multiple cross-hedges with the lowest MSFE of net-about- target price are shown.

Looking first at the second column in table 8, all the AFE's are negative for Arkansas, Louisiana, and Texas, and are positive for California. This indicates that the target price overestimates the subsequent net price in Arkansas, Louisiana, and Texas, and underestimates it in California. Also, the AFE's are closer to zero (implying that the net price is closer to the target price) for the multiple, compared with the simple, cross-hedges except for California millfeed.

The multiple cross-hedges, except for Arkansas bran, all have slightly lower MSFE's than the simple cross-hedges (table 8). This suggests that rice bran and millfeed can be priced with a bit more precision using a multiple cross-hedge. The MSFE's do not differ noticeably for millfeed; however, for bran the largest MSFE (California) is more than twice the smallest (Texas). Even among the three southern States, the largest MSFE for bran is more than 50 percent larger than the smallest. For millfeed, the difference from smallest to largest for the three southern States is only about 14 percent.

As a standard of comparison to net-about-target prices, AFE's and MSFE's were calculated for actual-about-target prices. Because the target price essentially projects the 3-month forward price, the variation of actual-about-target indicates risk associated with an unhedged position. Comparing net-about-target to actual-about-target, in general, hedging reduced MSFE. The only exception is rice millfeed in California. The reduction in MSFE's for hedging compared with not hedging is generally greater for bran cross-hedges than for millfeed. Bran cross-hedging reduces price variability from 5 to 42 percent, with the smallest reduction (except California) being Louisiana, with 27 percent. For millfeed, the reduction in MSFE's ranges from 16 to 24 percent. These findings indicate that cross-hedging can reduce the variation about the target or projected price. Thus, a

rice miller interested in pricing byproducts can use a cross-hedge to set price and achieve a less variable return than by not hedging. Based on the average difference between actual and net prices in column (1) of table 8, this practice should produce a higher average price than selling on the cash market. The range in net-about-actual price varies from 54 cents for Louisiana millfeed to \$2.23 for California bran.

Summary and Some Thoughts on Cross-Hedging Success

This study shows that risk is reduced through cross-hedging rice bran and millfeed. Corn futures were the most useful simple cross-hedging commodity. The most frequent multiple cross-hedging commodity combination was corn and oats futures. Over the simulation period, using a cross-hedge to price byproduct output reduced the variance of price received about the expected or target price by 5 to 42 percent (except California rice millfeed, where no reduction was realized).

Notwithstanding the results in table 8, some cautions are in order because cross-hedging is not always successful. Cross-hedging, like textbook hedging, involves foregoing uncertainty in price level for uncertainty in price relationships. The generalized basis figures in table 5 are estimates, subject to sampling variability and structural changes in the market. If the expected generalized basis at the time the cross-hedge is placed differs from the actual generalized basis when the cross-hedge is removed, then the net price received will differ from the target price. Looking back at the simple cross-hedge example in table 6, the expected generalized basis in mid-June was \$16 a ton whereas the actual mid-September generalized basis turned out to be \$6.04 a ton (\$58.50 - 18.9 x 2.77). The difference between \$16.60 and \$6.04 is \$10.56, and this is the approximate difference between the target of \$84.22 and net price of \$73.70. It is approximate because any discrepancy is related to the incremental nature of futures contracts that led to a futures position of 19 bushels a ton rather than 18.94 bushels a ton. Overestimating the generalized basis resulted in an equivalent overestimation of the net price received. If the generalized basis had been overestimated by more than \$25.72 (\$84.22 - \$58.50), the net price received from cross-hedging would have been less than the \$58.50-a-ton cash market price in September. This illustrates the importance of the generalized basis and the consequent danger of estimation errors.

A final aspect that has not been emphasized concerning the outcome of a rice byproduct cross-hedge is speculative judgment of the price level. A branded rice miller sells milled rice at more or less fixed prices. From the byproduct standpoint, the primary concern is when to sell the anticipated bran or millfeed production. The miller can wait until the rice is milled or can set the price by cross-hedging a year or more before the rice is milled. In either case, the sale is based on speculative judgment of price levels and is thus subject to error. If the miller prices the anticipated byproduct production expecting prices to fall and instead prices rise, then an opportunity for profit has been missed and the hedge might be considered unsuccessful. However, success or failure in profitmaking is different from success in achieving a target price.

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Table 5.—Quantities of futures required per ton of byproduct cross-hedged¹

| Byproduct | Futures | | | | Generalized basis ² | | | | | | | | | | | |
|----------------|----------------|--------|-------|--------------|--------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | Corn | Oats | Wheat | Soybean meal | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec |
| | <i>Bushels</i> | | | <i>Tons</i> | <i>Dollars per ton</i> | | | | | | | | | | | |
| Rice bran: | | | | | | | | | | | | | | | | |
| Arkansas | | | | | | | | | | | | | | | | |
| Simple | 18.94 | | | | 34.58 | 20.24 | 18.21 | 9.92 | 9.60 | 14.51 | 11.40 | 16.18 | 16.60 | 17.31 | 26.47 | 36.98 |
| Multiple | 15.73 | | 2.52 | | 33.56 | 19.29 | 17.53 | 9.61 | 9.65 | 14.58 | 11.55 | 15.71 | 15.58 | 16.26 | 25.35 | 35.96 |
| California | | | | | | | | | | | | | | | | |
| Simple | 26.59 | | | | 18.38 | 19.94 | 20.64 | 17.82 | 17.66 | 15.29 | 10.64 | 14.23 | 15.28 | 13.81 | 16.10 | 20.02 |
| Multiple | 25.44 | | | 0.04 | 14.14 | 15.67 | 16.26 | 13.19 | 12.81 | 10.25 | 5.99 | 9.77 | 11.18 | 9.68 | 11.58 | 15.30 |
| Louisiana | | | | | | | | | | | | | | | | |
| Simple | 17.43 | | | | 32.70 | 19.09 | 15.18 | 6.28 | 8.81 | 11.48 | 10.36 | 12.12 | 11.03 | 12.71 | 23.50 | 34.75 |
| Multiple | 22.65 | −9.80 | | | 34.25 | 21.06 | 15.96 | 7.62 | 10.77 | 12.52 | 10.60 | 12.12 | 11.88 | 14.02 | 24.96 | 36.84 |
| Texas | | | | | | | | | | | | | | | | |
| Simple | 18.89 | | | | 30.86 | 16.21 | 13.21 | 5.01 | 7.66 | 12.39 | 11.40 | 9.13 | 12.79 | 13.86 | 25.92 | 34.79 |
| Multiple | 23.21 | −8.08 | | | 32.07 | 17.78 | 14.27 | 6.05 | 9.21 | 13.11 | 11.95 | 9.31 | 13.43 | 14.87 | 27.05 | 36.34 |
| Rice Millfeed: | | | | | | | | | | | | | | | | |
| Arkansas | | | | | | | | | | | | | | | | |
| Simple | 7.79 | | | | 22.83 | 10.83 | 6.23 | 0.12 | 1.19 | 5.92 | 8.57 | 9.11 | 8.73 | 8.65 | 12.85 | 23.04 |
| Multiple | 13.67 | −11.04 | | | 24.59 | 13.07 | 7.12 | 1.65 | 3.42 | 7.22 | 9.25 | 9.14 | 9.71 | 10.14 | 14.74 | 25.42 |
| California | | | | | | | | | | | | | | | | |
| Simple | 23.37 | | | | 10.97 | 10.52 | 6.23 | 11.42 | 9.56 | 10.98 | 10.43 | 13.30 | 12.39 | 9.68 | 10.32 | 11.42 |
| Multiple | | 19.59 | 4.17 | | 0.65 | 0.37 | 3.57 | 2.40 | 1.55 | 2.43 | 1.40 | 3.72 | 2.03 | −0.67 | 0.13 | 1.89 |
| Louisiana | | | | | | | | | | | | | | | | |
| Simple | 6.65 | | | | 16.88 | 4.40 | 1.54 | −2.30 | −1.58 | 2.12 | 2.74 | 3.14 | 2.90 | 2.59 | 8.32 | 19.09 |
| Multiple | 11.11 | −8.45 | | | 18.31 | 6.19 | 2.31 | −0.83 | 0.02 | 3.11 | 3.05 | 3.24 | 3.73 | 3.81 | 9.69 | 20.99 |
| Texas | | | | | | | | | | | | | | | | |
| Simple | 7.07 | | | | 15.90 | 4.33 | 0.62 | −3.46 | −1.26 | 1.49 | 1.52 | 2.53 | 3.72 | 2.43 | 10.48 | 19.41 |
| Multiple | 11.79 | −8.83 | | | 17.25 | 6.06 | 1.81 | −2.29 | 0.47 | 2.31 | 2.08 | 2.75 | 4.44 | 3.56 | 11.75 | 21.13 |

¹Only the simple and multiple cross-hedge with the lowest mean-squared forecast error (MSFE) of net price-about-target price are reported (see table 9). ²Generalized basis is the average difference between the target price and a weighted combination of futures prices, where weights are the quantities of futures required to cross-hedge a ton of byproduct.

Table 6.—Simple cross-hedging example of Arkansas rice bran using corn futures

| Date | Cash | Futures |
|----------------|---|--|
| Mid-June 1981 | Target price = \$84.22 per ton 16.60 + [18.94 x (3.58 − 0.01)] | Sell 19,000 bu. (3 CBT + 4 MACE) @ \$3.58 per bu. (1000 x 18.94 = 18,940 bu.) |
| Mid-Sept. 1981 | Sell 1000 tons at \$58.50 per ton | Buy 19,000 bu. at ----- \$2.77 per bu. |
| | | Profit ----- +\$0.81 per bu. |

Cross-hedge summary:

\$ 58,500 cash bran price (\$58.50 per ton x 1000 tons)
+ 15,390 corn futures profit (19,000 bu. x \$0.81 a bu.)
− 190 futures transaction costs (19,000 bu. x \$0.01 a bu.)
\$ 73,700 net return (\$73.30 per ton)

Table 7.—Multiple cross-hedge example of Arkansas rice millfeed using corn and oats futures

| Date | Cash | Futures | |
|----------------|--|--|--|
| | | Corn | Oats |
| Mid-June 1981 | Target price = \$35.16 per ton (9.71 + 13.67 x 3.58 — 11.04 x 2.105 — 24.71 x 0.01) | Sell 41,000 bu. (8 CBT + 1 MACE) at \$3.58 a bu. (3000 x 13.67 = 41,010 bu.) | Buy 33,000 bu. (6 CBT + 3 MACE) at \$2.105 a bu. (3000 x 11.04 = 33,120 bu.) |
| Mid-Sept. 1981 | Sell 3000 tons at \$24.50 a ton | Buy 41,000 bu. at \$2.77 a bu. Profit +\$0.81 per bu. | Sell 33,000 bu. at \$1.99 a bu. Profit —\$0.115 per bu. |

Cross-hedge summary:

\$ 73,500 cash millfeed price (\$24.50 a ton x 3000 tons)
+ 33,210 corn futures profit (41,000 bu. x \$0.81 a bu.)
— 3,795 oats futures loss (33,000 bu. x \$0.115 bu.)
— 790 futures transactions costs (74,000 bu. x \$0.01 a bu.)
\$ 102,175 net return (\$34.06 per ton)

Table 8.—Price risk reduction achieved by cross-hedging rice byproducts¹

| Byproduct | Average of actual price minus net price | AFE of net price minus target price ² | MSFE ³ | | |
|----------------------------|---|--|------------------------------------|---------------------|---------------------------------|
| | | | Actual minus target | Net minus target | Reduction from cross-hedging |
| | <i>Dollars per ton</i> | | <i>Dollars per ton²</i> | | <i>Percent</i> |
| Arkansas (80) ⁴ | | | | | |
| Simple | -1.48 | -0.84 | 150.10 | 100.25 | 33 |
| Multiple | -1.57 | -0.64 | 143.91 | 101.04 | 30 |
| California (82) | | | | | |
| Simple | -2.11 | 6.03 | 179.10 | 169.67 | 5 |
| Multiple | -2.23 | 5.59 | 174.83 | 164.71 | 6 |
| Louisiana (76) | | | | | |
| Simple | -1.42 | -2.42 | 161.48 | 117.69 | 27 |
| Multiple | -1.63 | -0.92 | 158.08 | 114.91 | 27 |
| Texas (78) | | | | | |
| Simple | -1.58 | -2.28 | 129.53 | 75.35 | 42 |
| Multiple | -1.85 | -1.77 | 126.61 | 74.51 | 41 |
| Rice Millfeed: | | | | | |
| Arkansas (80) | | | | | |
| Simple | -0.57 | -3.46 | 86.40 | 67.17 | 22 |
| Multiple | -0.74 | -2.44 | 80.81 | 61.63 | 24 |
| California (82) | | | | | |
| Simple | -0.82 | 1.94 | 59.59 | 62.56 | — |
| Multiple | -0.63 | 2.77 | 42.23 | 48.90 | — |
| Louisiana (71) | | | | | |
| Simple | -0.54 | -2.97 | 83.73 | 70.12 | 16 |
| Multiple | -0.62 | -1.90 | 80.08 | 67.02 | 16 |
| Texas (79) | | | | | |
| Simple | -0.60 | -3.74 | 76.41 | 61.66 | 19 |
| Multiple | -0.76 | -3.42 | 73.78 | 58.40 | 21 |

¹Target and net prices are reduced by assumed hedging costs (round turn commissions and interest on margin accounts) of \$0.01 per bu. for corn, oats, and wheat, and \$0.50 per ton for soybean meal. ²AFE = average forecast error, or the average difference between net and target prices. ³MSFE = mean-squared forecast error, or the mean of the squared differences between net and target prices. ⁴The number of simulated cross-hedges is indicated in parentheses.

**Table 9.—Rice (rough equivalent):
Supply, disappearance, area, and prices¹**

| Item | 1980/81 | 1981/82 | 1982/83 ² | 1983/84 ³ |
|-------------------------------|---------|---------|----------------------|----------------------|
| <i>Million cwt</i> | | | | |
| Supply | | | | |
| Beginning stocks, August 1 | 25.7 | 16.5 | 49.0 | 71.5 |
| Production | 146.2 | 182.7 | 153.6 | 99.7 |
| Total ⁴ | 172.1 | 199.6 | 203.1 | 171.9 |
| Disappearance | | | | |
| Domestic ⁵ | 64.2 | 68.6 | 62.9 | 67.0 |
| Exports | 91.4 | 82.0 | 68.9 | 65.0 |
| Total | 155.6 | 150.6 | 131.8 | 132.0 |
| Ending stocks, July 31 | 16.5 | 49.0 | 71.5 | 39.9 |
| <i>Million acres</i> | | | | |
| Area | | | | |
| Planted | 3.38 | 3.83 | 3.29 | 2.19 |
| Harvested | 3.31 | 3.79 | 3.26 | 2.17 |
| Allotment | 1.80 | 1.80 | — | — |
| <i>Pounds per acre</i> | | | | |
| Yield per harvested acre | 4,413 | 4,819 | 4,708 | 4,598 |
| <i>Dollars per cwt</i> | | | | |
| Prices | | | | |
| Received by farmers | 12.80 | 9.05 | 8.11 | 8.50-9.00 |
| Loan rate | 7.12 | 8.01 | 8.14 | 8.14 |
| Target rate | 9.49 | 10.68 | 10.85 | 11.40 |

¹Consolidated supply and disappearance of rough and milled rice. Milled-rice data converted to rough-rice basis using annually derived extraction rates as factors. ²Preliminary. ³Projected. ⁴Includes imports. ⁵Includes food, seed, brewers' use, and a residual. Food use includes shipments to U.S. territories.

Table 10.—Rough rice: Supply and disappearance¹

| Item | Year beginning August 1 | | | August-December ² | |
|---------------------------|----------------------------|---------|-------------------|------------------------------|---------|
| | 1980 | 1981 | 1982 ² | 1982 | 1983 |
| <i>1,000 cwt</i> | | | | | |
| Beginning stocks | 20,093 | 9,840 | 41,387 | 41,387 | 63,157 |
| Farm production | 146,150 | 182,742 | 153,588 | 153,588 | 99,720 |
| Supply | 166,243 | 192,582 | 194,975 | 194,975 | 162,877 |
| Domestic ³ | 155,989 | 145,410 | 131,244 | 59,831 | 47,073 |
| Exports | 414 | 5,785 | 574 | 172 | 1,550 |
| Disappearance | 156,403 | 151,195 | 131,818 | 60,003 | 48,623 |
| Ending stocks, July 31 | 9,840 | 41,387 | 63,157 | 134,972 | 114,254 |

¹Includes supply and disappearance of rough rice only. ²Preliminary. ³Includes mill use, seed, and a residual.

Table 11.—Milled rice: Supply and disappearance¹

| Item | Year beginning August 1 | | | August-December ² | |
|---------------------------|----------------------------|---------|-------------------|------------------------------|--------|
| | 1980 | 1981 | 1982 ² | 1982 | 1983 |
| <i>1,000 cwt</i> | | | | | |
| Beginning stocks | 4,035 | 4,855 | 5,477 | 5,477 | 5,896 |
| Production | 103,037 | 95,074 | 84,475 | 35,014 | 34,146 |
| Imports | 160 | 278 | 469 | 194 | 220 |
| Supply | 107,232 | 100,207 | 90,421 | 40,685 | 40,262 |
| Food ³ | 27,957 | 30,702 | 26,413 | 10,086 | 9,029 |
| Brewers' use | 8,001 | 9,123 | 9,613 | 3,788 | 3,439 |
| Exports | 66,419 | 54,905 | 48,499 | 20,592 | 22,076 |
| Disappearance | 102,377 | 94,730 | 84,525 | 34,466 | 34,544 |
| Ending stocks, July 31 | 4,855 | 5,477 | 5,896 | 6,219 | 5,718 |

¹Includes supply and disappearance of milled rice only. ²Preliminary. ³Includes shipments to U.S. territories.

Table 12.—Rice: Acreage, yield, production, by type and State

| Type and State | Planted | | Harvested | | Yield | | Production | |
|----------------|--------------------|-------------------|-----------|--------|---------------|-------|------------------|--------|
| | 1983 | 1984 ¹ | 1982 | 1983 | 1982 | 1983 | 1982 | 1983 |
| | <i>1,000 acres</i> | | | | <i>Pounds</i> | | <i>1,000 cwt</i> | |
| Long grain | | | | | | | | |
| Arkansas | 811.0 | 1,093.0 | 1,134.0 | 8,030 | 4,200 | 4,200 | 47,608 | 33,726 |
| California | 22.0 | 50.0 | 14.0 | 220 | 5,900 | 5,950 | 826 | 1,309 |
| Louisiana | 210.0 | 235.0 | 269.0 | 2,060 | 4,075 | 3,700 | 10,962 | 7,622 |
| Mississippi | 162.0 | 200.0 | 245.0 | 1,610 | 4,100 | 4,000 | 10,045 | 6,440 |
| Missouri | 61.0 | 70.0 | 71.0 | 600 | 4,450 | 4,100 | 3,160 | 2,460 |
| Texas | 310.0 | 458.0 | 442.0 | 3,080 | 4,700 | 4,375 | 20,774 | 13,475 |
| U.S. | 1,576.0 | 2,106.0 | 2,175.0 | 15,600 | 4,293 | 4,169 | 93,375 | 65,032 |
| Medium grain | | | | | | | | |
| Arkansas | 103.0 | 105.0 | 175.0 | 1,020 | 4,800 | 4,875 | 8,400 | 4,973 |
| California | 200.0 | 320.0 | 406.0 | 1,990 | 6,700 | 7,100 | 27,202 | 14,129 |
| Louisiana | 180.0 | 190.0 | 329.0 | 1,790 | 4,225 | 3,950 | 13,900 | 7,071 |
| Missouri | 2.0 | 1.0 | 8.5 | 20 | 4,700 | 3,700 | 400 | 74 |
| Texas | 10.0 | 2.0 | 32.0 | 100 | 4,500 | 3,300 | 1,440 | 330 |
| U.S. | 495.0 | 618.0 | 950.5 | 4,920 | 5,402 | 5,402 | 51,342 | 26,577 |
| Short grain | | | | | | | | |
| Arkansas | 11.0 | 12.0 | 21.0 | 100 | 4,900 | 4,600 | 1,029 | 460 |
| California | 108.0 | 80.0 | 115.0 | 1,070 | 6,800 | 7,150 | 7,820 | 7,651 |
| Missouri | | | .5 | | 4,400 | | | |
| U.S. | 119.0 | 92.0 | 136.5 | 1,170 | 6,499 | 6,932 | 8,871 | 8,111 |
| All rice | | | | | | | | |
| Arkansas | 925.0 | 1,210.0 | 1,330.0 | 9,150 | 4,290 | 4,280 | 57,037 | 39,159 |
| California | 330.0 | 450.0 | 535.0 | 3,280 | 6,700 | 7,040 | 35,848 | 23,089 |
| Louisiana | 390.0 | 425.0 | 598.0 | 3,850 | 4,160 | 3,820 | 24,862 | 14,693 |
| Mississippi | 162.0 | 200.0 | 245.0 | 1,610 | 4,100 | 4,000 | 10,045 | 6,440 |
| Missouri | 63.0 | 71.0 | 80.0 | 620 | 4,480 | 4,090 | 3,582 | 2,534 |
| Texas | 320.0 | 460.0 | 474.0 | 3,180 | 4,690 | 4,340 | 22,214 | 13,805 |
| U.S. | 2,190.0 | 2,816.0 | 3,262.0 | 21,690 | 4,708 | 4,598 | 153,588 | 99,720 |

¹Intended plantings in 1984 as indicated by reports from farmers.**Table 13.—Rice stocks: Rough and milled¹**

| Date | Rough | | | | | Milled | | | |
|-------------------|--------------------------------|-------------------------------------|--|------------------------|---------------------|-------------------------------------|--|------------------------|---------------------|
| | On farms or in farm warehouses | At mills and in attached warehouses | In ware-houses (not attached to mills) | In ports or in transit | Total all positions | At mills and in attached warehouses | In ware-houses (not attached to mills) | In ports or in transit | Total all positions |
| | <i>1,000 cwt</i> | | | | | | | | |
| January 1 | | | | | | | | | |
| 1979 | 28,089 | 16,829 | 50,100 | 899 | 95,917 | 3,517 | 542 | 2,080 | 6,139 |
| 1980 | 31,021 | 15,038 | 57,278 | 581 | 103,918 | 3,137 | 810 | 2,123 | 6,070 |
| 1981 | 26,179 | 21,111 | 48,817 | 6 | 96,113 | 3,055 | 929 | 2,556 | 6,540 |
| 1982 | 48,404 | 22,952 | 59,117 | 911 | 131,384 | 2,735 | 907 | 1,414 | 5,056 |
| 1983 | 34,551 | 24,151 | 76,070 | 200 | 134,972 | 2,960 | 858 | 2,401 | 6,219 |
| 1984 ² | 30,523 | 19,541 | 63,846 | 344 | 114,254 | 3,867 | 456 | 1,395 | 5,718 |
| April 1 | | | | | | | | | |
| 1979 | 14,381 | 18,158 | 34,161 | 820 | 67,520 | 3,979 | 282 | 2,444 | 6,705 |
| 1980 | 12,030 | 15,581 | 39,224 | 563 | 67,398 | 3,500 | 402 | 2,888 | 6,790 |
| 1981 | 5,977 | 15,078 | 28,673 | 64 | 49,792 | 3,499 | 1,099 | 3,214 | 7,812 |
| 1982 | 26,807 | 21,289 | 41,773 | 411 | 90,280 | 4,371 | 725 | 1,689 | 6,785 |
| 1983 ² | 23,778 | 22,307 | 62,649 | 299 | 109,033 | 3,295 | 492 | 3,165 | 6,952 |
| August 1 | | | | | | | | | |
| 1979 | 623 | 8,781 | 15,033 | 701 | 25,138 | 2,531 | 374 | 1,678 | 4,583 |
| 1980 | 563 | 9,248 | 9,940 | 342 | 20,093 | 2,128 | 403 | 1,504 | 4,035 |
| 1981 | 208 | 5,417 | 4,206 | 9 | 9,840 | 2,744 | 446 | 1,665 | 4,855 |
| 1982 | 4,453 | 12,544 | 23,906 | 484 | 41,387 | 3,191 | 409 | 1,877 | 5,477 |
| 1983 ² | 6,032 | 11,190 | 45,899 | 36 | 63,157 | 2,843 | 223 | 2,830 | 5,896 |

¹These estimates do not include stocks located in States outside the major producing States of Missouri, Mississippi, Arkansas, Louisiana, Texas, and California. ²Preliminary.

Rice Stocks, Crop Reporting Board.

Table 14.—Rough rice milled, total milled production, and milling yields, United States

| Year beginning August | Rough milled | Total milled produced ¹ | Milling yields | Total heads produced ¹ | Milling yields |
|-----------------------|--------------|------------------------------------|----------------|-----------------------------------|----------------|
| | 1,000 cwt | | Pounds/cwt | 1,000 cwt | Pounds/cwt |
| 1978 | 117,961.0 | 83,427.0 | 70.72 | 68,749.0 | 58.28 |
| 1979 | 124,340.0 | 89,820.0 | 72.24 | 78,942.8 | 63.49 |
| 1980 | 141,192.0 | 103,037.0 | 72.98 | 89,601.7 | 63.46 |
| 1981 | 131,922.0 | 95,074.0 | 72.07 | 82,010.7 | 62.17 |
| 1982 ² | 119,536.0 | 84,475.0 | 70.67 | 73,764.2 | 61.71 |

¹Includes brown rice. ²Preliminary.

Compiled from Monthly Statistical Statements, Rice Miller's Association, and Rice Market News, AMS.

Table 15.—Rough rice: Average price received by farmers

| Month | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|------------------|-----------------|------|-------|-------|-------|------|------|-------|------|-------|-------|-------|------|------|
| | Dollars per cwt | | | | | | | | | | | | | |
| August | 5.16 | 5.15 | 5.34 | 10.90 | 10.20 | 9.83 | 6.65 | 8.02 | 8.44 | 10.00 | 10.60 | 11.80 | 7.31 | 8.40 |
| September | 5.18 | 5.24 | 6.37 | 13.30 | 10.90 | 9.19 | 6.56 | 8.12 | 7.56 | 9.81 | 10.20 | 10.70 | 7.75 | 8.48 |
| October | 5.26 | 5.46 | 7.05 | 14.80 | 11.30 | 8.87 | 6.48 | 9.13 | 7.62 | 10.30 | 10.90 | 10.20 | 7.73 | 8.80 |
| November | 5.19 | 5.25 | 7.42 | 16.70 | 11.60 | 8.59 | 6.46 | 10.20 | 7.76 | 9.83 | 11.60 | 9.86 | 7.78 | 8.82 |
| December | 5.09 | 5.30 | 7.64 | 15.50 | 10.90 | 8.51 | 6.57 | 11.00 | 7.98 | 9.41 | 13.10 | 9.34 | 8.06 | 8.66 |
| January | 5.31 | 5.53 | 7.84 | 15.80 | 10.80 | 7.95 | 6.79 | 10.70 | 8.07 | 9.88 | 13.20 | 9.34 | 8.05 | 8.69 |
| February | 5.44 | 5.55 | 8.14 | 16.90 | 11.30 | 7.54 | 6.87 | 10.70 | 7.87 | 11.00 | 13.00 | 9.46 | 8.26 | |
| March | 5.36 | 5.60 | 8.26 | 17.20 | 11.10 | 6.17 | 6.81 | 10.70 | 8.18 | 11.70 | 13.40 | 8.99 | 7.99 | |
| April | 5.33 | 5.58 | 8.51 | 15.90 | 11.00 | 7.15 | 6.95 | 10.80 | 8.52 | 11.60 | 13.80 | 8.54 | 8.23 | |
| May | 5.30 | 5.57 | 8.56 | 17.20 | 11.10 | 7.06 | 7.30 | 10.10 | 8.74 | 11.30 | 13.30 | 8.55 | 8.23 | |
| June | 5.20 | 5.58 | 8.74 | 17.50 | 11.20 | 6.82 | 7.24 | 9.58 | 8.73 | 10.20 | 11.90 | 8.54 | 7.88 | |
| July | 5.33 | 5.35 | 10.80 | 11.90 | 10.00 | 7.45 | 6.87 | 9.49 | 9.10 | 10.80 | 12.80 | 8.25 | 7.95 | |
| Weighted average | 5.17 | 5.34 | 6.73 | 13.80 | 11.20 | 8.35 | 7.02 | 9.49 | 8.16 | 10.50 | 12.80 | 9.05 | 8.11 | |
| Loan rate | 4.86 | 5.07 | 5.27 | 6.07 | 7.54 | 8.52 | 6.19 | 6.19 | 6.40 | 6.79 | 7.12 | 8.01 | 8.14 | 8.14 |

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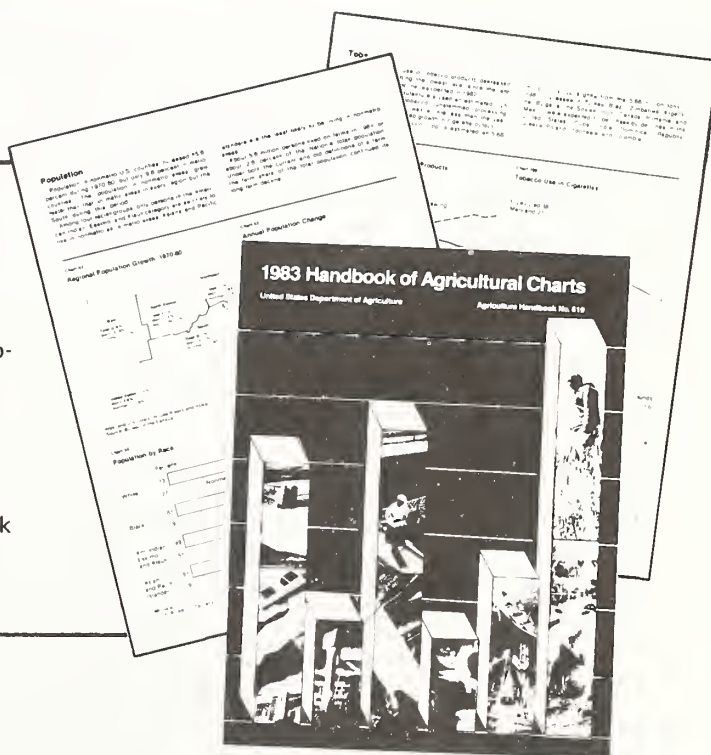


Table 16.—Milled rice: Average price for U.S. No. 2, fob mills, at selected milling centers

| Year and type | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Simple average |
|-------------------------------|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------------|
| <i>Dollars per cwt bagged</i> | | | | | | | | | | | | | |
| Long ¹ | Southwest Louisiana | | | | | | | | | | | | |
| 1980 | 20.75 | 22.00 | 23.40 | 25.00 | 26.75 | 27.00 | 27.25 | 27.70 | 28.25 | 28.00 | 27.90 | 27.50 | 25.95 |
| 1981 | 26.40 | 24.30 | 23.25 | 21.90 | 20.75 | 19.80 | 18.60 | 18.00 | 17.55 | 17.60 | 17.20 | 17.00 | 20.20 |
| 1982 | 17.50 | 17.40 | 17.50 | 17.55 | 18.40 | 18.35 | 17.50 | 17.50 | 18.50 | 18.50 | 18.60 | 18.75 | 18.00 |
| 1983 ² | 19.40 | 19.75 | 19.35 | 19.50 | 19.50 | 19.50 | | | | | | | |
| | Houston, Texas | | | | | | | | | | | | |
| 1980 | 21.00 | 21.70 | 23.10 | 24.75 | 26.55 | 26.55 | 25.75 | 27.10 | 27.75 | 28.00 | 27.40 | 27.00 | 25.55 |
| 1981 | 25.00 | 24.85 | 23.50 | 22.60 | 22.00 | 21.75 | 20.20 | 19.20 | 19.00 | 19.00 | 18.75 | 17.75 | 21.15 |
| 1982 | 18.25 | 18.75 | 18.00 | 18.00 | 18.00 | 19.00 | 19.00 | 19.00 | 19.00 | 19.00 | 19.10 | 19.40 | 18.70 |
| 1983 ² | 19.50 | 19.65 | 20.00 | 20.00 | 20.00 | 20.25 | | | | | | | |
| | Arkansas | | | | | | | | | | | | |
| 1980 | 20.60 | 22.00 | 23.40 | 24.90 | 26.10 | 26.10 | 25.75 | 26.70 | 27.50 | 28.00 | 27.90 | 27.50 | 25.55 |
| 1981 | 26.40 | 24.30 | 23.05 | 22.30 | 20.85 | 19.60 | 19.00 | 18.20 | 17.55 | 17.40 | 17.20 | 16.60 | 20.20 |
| 1982 | 17.10 | 17.00 | 17.00 | 17.55 | 18.40 | 18.35 | 17.50 | 17.50 | 18.00 | 18.40 | 18.50 | 18.50 | 17.80 |
| 1983 ² | 18.50 | 18.50 | 18.85 | 19.00 | 19.00 | 19.00 | | | | | | | |
| Medium ¹ | Southwest Louisiana | | | | | | | | | | | | |
| 1980 | 20.50 | 20.80 | 21.60 | 24.40 | 26.40 | 27.00 | 27.10 | 27.50 | 27.55 | 28.00 | 28.00 | 27.75 | 25.55 |
| 1981 | 26.40 | 24.20 | 22.90 | 21.15 | 20.00 | 18.75 | 17.75 | 16.10 | 15.95 | 16.40 | 16.20 | 16.00 | 19.30 |
| 1982 | 16.50 | 16.50 | 16.45 | 16.65 | 17.75 | 17.30 | 16.50 | 16.50 | 16.50 | 17.10 | 17.50 | 17.50 | 16.90 |
| 1983 ² | 17.50 | 17.50 | 17.50 | 17.50 | 17.50 | 17.50 | | | | | | | |
| | Arkansas | | | | | | | | | | | | |
| 1980 | 20.60 | 21.30 | 22.50 | 24.00 | 25.75 | 26.10 | 25.75 | 26.70 | 27.40 | 28.00 | 28.00 | 27.50 | 25.30 |
| 1981 | 26.40 | 24.10 | 22.95 | 21.30 | 19.85 | 18.60 | 17.90 | 17.05 | 16.50 | 16.40 | 15.90 | 15.60 | 19.40 |
| 1982 | 16.10 | 16.50 | 16.10 | 16.65 | 17.75 | 17.10 | 16.50 | 16.50 | 16.60 | 17.10 | 17.50 | 17.50 | 16.80 |
| 1983 ² | 17.50 | 17.50 | 17.50 | 17.50 | 17.50 | 17.50 | | | | | | | |
| Medium ³ | California | | | | | | | | | | | | |
| 1980 | 23.00 | 23.20 | 24.75 | 25.00 | 26.75 | 30.00 | 30.00 | 30.00 | 30.00 | 30.00 | 30.00 | 30.00 | 27.70 |
| 1981 | 30.00 | 27.60 | 24.50 | 22.80 | 21.40 | 20.50 | 19.10 | 18.45 | 16.90 | 16.90 | 16.70 | 16.40 | 20.95 |
| 1982 | 16.25 | 16.10 | 15.55 | 15.50 | 15.50 | 16.50 | 16.00 | 16.00 | 16.00 | 15.90 | 15.95 | 15.75 | 15.90 |
| 1983 ² | 15.65 | 15.50 | 15.70 | 15.50 | 15.50 | 15.50 | | | | | | | |
| Short ³ | | | | | | | | | | | | | |
| 1980 | 23.00 | 23.20 | 24.75 | 25.00 | 26.75 | 30.00 | 30.00 | 30.00 | 30.00 | 30.00 | 30.00 | 30.00 | 27.70 |
| 1981 | 30.00 | 28.25 | 25.75 | 23.90 | 22.00 | 22.00 | 20.25 | 19.50 | 18.25 | 18.25 | 18.25 | 18.10 | 22.05 |
| 1982 | 17.20 | 16.70 | 15.55 | 15.50 | 15.50 | 16.90 | 16.00 | 16.00 | 16.00 | 16.00 | 16.00 | 16.00 | 16.10 |
| 1983 ² | 15.80 | 15.50 | 15.70 | 15.50 | 15.50 | 15.50 | | | | | | | |

¹U.S. No. 2—broken not to exceed 4 percent. ²Preliminary. ³U.S. No. 1.

Compiled from Rice Market News, AMS.

Table 17.—Rice byproducts: Monthly average price, southwest Louisiana

| Year and type | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Simple average |
|--|-------|-------|-------|--------|--------|--------|-------|-------|-------|-------|-------|-------|----------------|
| <i>Dollars per cwt, bagged¹</i> | | | | | | | | | | | | | |
| Milled second head | | | | | | | | | | | | | |
| 1980 | 11.05 | 10.70 | 11.00 | 11.15 | 12.45 | 12.90 | 12.75 | 13.55 | 13.40 | 14.45 | 14.55 | 14.10 | 12.65 |
| 1981 | 13.00 | 11.90 | 11.00 | 11.00 | 11.00 | 10.60 | 10.00 | 8.60 | 9.25 | 10.00 | 10.00 | 10.00 | 10.55 |
| 1982 | 10.00 | 9.75 | 9.75 | 9.75 | 9.75 | 9.75 | 9.75 | 9.75 | 9.75 | 9.75 | 9.75 | 9.75 | 9.75 |
| 1983 | 9.75 | 10.25 | 10.25 | 10.25 | 10.25 | 10.25 | | | | | | | |
| <i>Dollars per ton²</i> | | | | | | | | | | | | | |
| Rice bran, fob mills | | | | | | | | | | | | | |
| 1980 | 76.90 | 84.70 | 86.40 | 95.50 | N.Q. | 101.90 | 73.60 | 59.10 | 57.50 | 60.00 | 71.60 | 69.15 | 76.05 |
| 1981 | 51.50 | 49.60 | 52.75 | 59.90 | 73.65 | 82.50 | 64.35 | 50.40 | 55.50 | 57.50 | 61.10 | N.Q. | 59.90 |
| 1982 | 52.80 | 53.00 | 54.00 | 77.65 | 85.00 | 77.50 | 52.15 | 47.25 | 59.65 | 70.30 | 61.25 | N.Q. | 62.80 |
| 1983 | 62.15 | 70.00 | 94.00 | 108.35 | 120.85 | 98.50 | | | | | | | |
| <i>Dollars per ton²</i> | | | | | | | | | | | | | |
| Rice millfeed, fob mills | | | | | | | | | | | | | |
| 1980 | 29.50 | 37.40 | 35.00 | 36.90 | 48.40 | 54.00 | 15.00 | 11.00 | 14.95 | 17.00 | 27.00 | 31.40 | 29.80 |
| 1981 | 22.60 | 10.90 | 17.75 | 22.00 | 30.65 | 29.75 | 16.50 | 13.15 | 13.40 | 15.40 | 19.40 | N.Q. | 19.25 |
| 1982 | 16.00 | 16.75 | 15.25 | 26.15 | 35.00 | 45.00 | 13.50 | 15.25 | 19.35 | 23.60 | 22.10 | 23.00 | 22.60 |
| 1983 | 24.00 | 25.40 | 33.30 | 42.10 | 61.65 | 53.00 | | | | | | | |

¹U.S. No. 4 or better. ²Prices quoted as bulk. NQ = not quoted.

Compiled from Rice Market News, MAS.

Table 18.—Brewers' prices: Monthly average price for Arkansas brewers' rice and New York brewers' corn grits

| Year and State | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Simple average |
|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------------|
| <i>Dollars per cwt</i> | | | | | | | | | | | | | |
| Arkansas | | | | | | | | | | | | | |
| 1980/81 | 9.75 | 9.75 | 9.80 | 10.10 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 9.60 | 9.50 | 9.90 |
| 1981/82 | 9.30 | 9.00 | 8.55 | 8.25 | 8.25 | 8.20 | 7.60 | 7.40 | 7.30 | 7.00 | 7.00 | 6.80 | 7.90 |
| 1982/83 | 6.55 | 6.50 | 6.50 | 6.50 | 6.50 | 6.50 | 6.50 | 6.50 | 6.50 | 6.50 | 6.50 | 6.50 | 6.50 |
| 1983/84 | 6.50 | 6.75 | 7.00 | 7.00 | 6.90 | 6.76 | | | | | | | |
| New York | | | | | | | | | | | | | |
| 1980/81 | 11.60 | 12.11 | 12.26 | 12.74 | 12.42 | 12.44 | 12.60 | 12.64 | 12.72 | 12.42 | 12.57 | 12.85 | 12.45 |
| 1981/82 | 12.22 | 10.45 | 10.16 | 9.96 | 9.97 | 9.97 | 10.28 | 10.48 | 10.82 | 10.75 | 10.66 | 10.43 | 10.51 |
| 1982/83 | 9.91 | 9.75 | 9.60 | 9.74 | 9.78 | 10.07 | 10.52 | 10.82 | 11.35 | 11.32 | 11.58 | 12.06 | 10.54 |
| 1983/84 | 12.85 | 13.06 | 12.77 | 12.64 | 11.96 | 11.81 | | | | | | | |

Compiled from Rice Market News, AMS, and Milling and Baking News.

Table 19.—Thailand milled rice prices, fob Bangkok¹

| Type | 1980/81 | 1981/82 | 1982/83 | 1983/84 |
|-------------------------------|---------|---------|---------|---------|
| <i>Dollars per metric ton</i> | | | | |
| 100% 1st grade | | | | |
| August | 463 | 528 | 330 | 326 |
| September | 463 | 517 | 313 | 349 |
| October | 463 | 485 | 295 | 336 |
| November | 484 | 458 | 299 | 333 |
| December | 491 | 409 | 307 | 321 |
| January | 491 | 378 | 301 | 310 |
| February | 501 | 364 | 318 | |
| March | 529 | 370 | 330 | |
| April | 540 | 356 | 330 | |
| May | 544 | 342 | 330 | |
| June | 560 | 334 | 319 | |
| July | 551 | 325 | 311 | |
| Average | 507 | 406 | 315 | |
| 100% 2nd grade | | | | |
| August | 450 | 508 | 300 | 286 |
| September | 450 | 497 | 283 | 309 |
| October | 450 | 465 | 266 | 300 |
| November | 471 | 438 | 269 | 293 |
| December | 478 | 389 | 277 | 281 |
| January | 478 | 352 | 270 | 267 |
| February | 488 | 332 | 280 | |
| March | 514 | 340 | 290 | |
| April | 525 | 326 | 290 | |
| May | 529 | 312 | 290 | |
| June | 545 | 304 | 279 | |
| July | 533 | 295 | 271 | |
| Average | 493 | 380 | 280 | |
| 5% broken | | | | |
| August | 442 | 498 | 287 | 279 |
| September | 442 | 487 | 270 | 299 |
| October | 442 | 455 | 255 | 290 |
| November | 463 | 428 | 258 | 283 |
| December | 470 | 379 | 266 | 271 |
| January | 470 | 342 | 260 | 257 |
| February | 480 | 324 | 270 | |
| March | 505 | 325 | 282 | |
| April | 515 | 311 | 282 | |
| May | 519 | 299 | 280 | |
| June | 535 | 291 | 269 | |
| July | 523 | 282 | 261 | |
| Average | 484 | 368 | 270 | |

¹Includes export premium, export tax, and cost of bags. Packed in bags of 100 kgs net. Compiled from Rice Market News, AMS.

Table 20.—Milled rice: Average cif quotations, at Rotterdam

| Type | 1980/81 | 1981/82 | 1982/83 | 1983/84 |
|-------------------------------|---------|---------|---------|---------|
| <i>Dollars per metric ton</i> | | | | |
| U.S. No. 2 milled, 4%, bagged | | | | |
| August | 552 | 629 | 515 | 535 |
| September | 567 | 601 | 463 | 535 |
| October | 602 | 587 | 449 | 530 |
| November | 639 | 562 | 446 | 520 |
| December | 656 | 538 | 451 | 518 |
| January | 661 | 517 | 459 | 518 |
| February | 670 | 508 | 488 | |
| March | 672 | 485 | 496 | |
| April | 672 | 469 | 504 | |
| May | 675 | 474 | 513 | |
| June | 662 | 487 | 532 | |
| July | 649 | 506 | 535 | |
| Average | 640 | 530 | 488 | |
| Thai SWR 100% Grade A, bagged | | | | |
| August | 535 | 603 | 369 | 383 |
| September | 543 | 600 | 363 | 410 |
| October | 539 | 570 | 347 | 392 |
| November | 545 | 520 | 352 | 369 |
| December | 550 | 483 | 363 | 355 |
| January | 580 | 438 | 360 | 351 |
| February | 614 | 424 | 366 | |
| March | 627 | 426 | 389 | |
| April | 620 | 422 | 376 | |
| May | 632 | 408 | 382 | |
| June | 657 | 376 | 372 | |
| July | 641 | 346 | 367 | |
| Average | 590 | 468 | 367 | |
| Thai SWR 100% Grade B, bagged | | | | |
| August | 520 | 583 | 342 | 345 |
| September | 528 | 579 | 338 | 368 |
| October | 523 | 549 | 322 | 351 |
| November | 528 | 497 | 328 | 329 |
| December | 535 | 463 | 338 | 317 |
| January | 549 | 418 | 336 | 315 |
| February | 588 | 402 | 335 | |
| March | 602 | 405 | 348 | |
| April | 600 | 401 | 336 | |
| May | 611 | 382 | 342 | |
| June | 633 | 352 | 335 | |
| July | 619 | 319 | 330 | |
| Average | 570 | 446 | 336 | |

Compiled from Rice Market News, AMS.

Table 21.—World rice supply and utilization

| Year | Area harvested | Yield ¹ | Production ² | | Exports ³ | Total use ⁴ | Ending stocks ⁵ | Stocks to use ratio ⁶ |
|----------------------|-------------------------|--------------------|-------------------------|--------|----------------------|----------------------------|----------------------------|----------------------------------|
| | | | Rough | Milled | | | | |
| | <i>Million hectares</i> | | | | | <i>Million metric tons</i> | | |
| 1960/61 | 120.1 | 1.95 | 233.8 | 160.0 | 6.5 | 160.3 | 8.0 | 5.0 |
| 1961/62 | 115.7 | 1.86 | 215.7 | 147.3 | 6.3 | 147.7 | 7.0 | 4.8 |
| 1962/63 | 119.6 | 1.91 | 228.2 | 155.2 | 7.3 | 155.3 | 6.9 | 4.4 |
| 1963/64 | 121.5 | 2.05 | 248.4 | 169.1 | 7.7 | 167.2 | 8.7 | 5.2 |
| 1964/65 | 125.3 | 2.12 | 265.6 | 180.8 | 8.2 | 177.8 | 11.8 | 6.6 |
| 1965/66 | 124.0 | 2.05 | 254.2 | 173.3 | 7.9 | 173.1 | 12.0 | 6.9 |
| 1966/67 | 125.7 | 2.09 | 262.5 | 179.3 | 7.8 | 180.7 | 10.6 | 5.9 |
| 1967/68 | 127.0 | 2.19 | 277.8 | 189.4 | 7.2 | 186.6 | 13.4 | 7.2 |
| 1968/69 | 128.7 | 2.23 | 287.0 | 195.6 | 7.5 | 192.3 | 16.7 | 8.7 |
| 1969/70 | 131.4 | 2.25 | 295.9 | 201.6 | 8.2 | 199.7 | 18.6 | 9.3 |
| 1970/71 | 132.7 | 2.36 | 313.5 | 213.6 | 8.6 | 214.5 | 17.7 | 8.3 |
| 1971/72 | 134.8 | 2.35 | 317.5 | 216.4 | 8.7 | 218.8 | 15.3 | 7.0 |
| 1972/73 | 132.7 | 2.31 | 307.2 | 209.6 | 8.4 | 214.6 | 10.3 | 4.8 |
| 1973/74 | 136.5 | 2.45 | 334.7 | 228.0 | 7.7 | 225.9 | 12.5 | 5.5 |
| 1974/75 | 137.8 | 2.41 | 332.1 | 226.3 | 7.3 | 228.1 | 10.7 | 4.7 |
| 1975/76 | 142.7 | 2.51 | 358.4 | 243.8 | 8.4 | 235.2 | 19.3 | 8.2 |
| 1976/77 | 141.3 | 2.46 | 348.3 | 236.8 | 10.6 | 238.4 | 17.7 | 7.4 |
| 1977/78 | 143.3 | 2.58 | 370.0 | 251.4 | 9.6 | 246.4 | 22.8 | 9.2 |
| 1978/81 | 144.1 | 2.69 | 387.6 | 263.7 | 12.0 | 258.6 | 27.8 | 10.8 |
| 1979/80 | 141.4 | 2.67 | 377.4 | 257.4 | 12.7 | 261.9 | 23.3 | 8.9 |
| 1980/81 | 144.3 | 2.76 | 377.4 | 257.4 | 12.7 | 261.9 | 23.3 | 8.9 |
| 1981/82 | 145.2 | 2.84 | 412.5 | 280.6 | 11.8 | 281.5 | 21.1 | 7.5 |
| 1982/83 ⁷ | 140.7 | 2.98 | 419.9 | 285.9 | 12.1 | 290.3 | 16.8 | 5.8 |
| 1983/84 ⁸ | 144.6 | 3.03 | 438.0 | 297.8 | 11.7 | 298.4 | 16.1 | 5.4 |

¹Yields are based on rough production. ²Production is expressed on both rough and milled basis: stocks, exports, and utilization are expressed on a milled basis. ³Exports quoted on calendar year basis. ⁴For countries for which stock data are not available, utilization estimates represent "apparent" utilization; i.e., they include annual stock level adjustments. ⁵Stocks data are based on an aggregate of differing market years and should not be construed as representing world stock levels at a fixed point in time. Stocks data are not available for all countries and exclude the USSR, China, North Korea, and parts of eastern Europe. ⁶Stocks-to-use represents the ratio of marketing year ending stocks to total utilization. ⁷Preliminary. ⁸Projected. Compiled from World Grain Situation, FAS.

Table 22.—World rice production and stocks: Selected countries or regions¹

| Country or region | Crop year ² | | | | |
|----------------------------|----------------------------|---------|---------|---------|------------------------|
| | 1979/80 | 1980/81 | 1981/82 | 1982/83 | 1983/84 as of March 12 |
| | <i>Million metric tons</i> | | | | |
| Bangladesh | 19.1 | 20.8 | 20.5 | 21.6 | 22.5 |
| Burma | 9.8 | 13.2 | 13.6 | 14.4 | 13.9 |
| China, Mainland | 143.8 | 139.9 | 144.0 | 161.2 | 163.0 |
| India | 63.6 | 80.5 | 80.5 | 69.8 | 85.6 |
| Indonesia | 26.3 | 29.7 | 32.8 | 34.1 | 34.3 |
| Japan | 14.9 | 12.2 | 12.8 | 12.8 | 13.0 |
| Korea, Rep. of | 7.3 | 6.0 | 7.1 | 7.3 | 7.4 |
| Pakistan | 4.8 | 4.7 | 5.1 | 5.2 | 5.3 |
| Thailand | 15.8 | 17.4 | 17.8 | 17.0 | 18.0 |
| Subtotal | 305.4 | 324.4 | 334.2 | 343.4 | 363.0 |
| Argentina | .3 | .3 | .4 | .3 | .3 |
| Australia | .6 | .7 | .9 | .5 | .8 |
| Brazil | 9.6 | 8.6 | 9.2 | 7.8 | 9.0 |
| EC-10 | 1.3 | 1.1 | 1.0 | 1.2 | 1.1 |
| All others | 54.4 | 57.1 | 59.0 | 59.7 | 59.6 |
| Total non-U.S. | 371.1 | 392.2 | 403.1 | 412.9 | 433.4 |
| U.S. | 6.0 | 6.6 | 8.3 | 7.0 | 4.5 |
| World total | 377.4 | 398.8 | 412.4 | 420.1 | 438.0 |
| Ending stocks ³ | | | | | |
| Non-U.S. | 22.5 | 21.5 | 19.5 | 14.4 | 14.8 |
| U.S. | .8 | .5 | 1.6 | 2.3 | 1.3 |
| World total | 23.3 | 22.1 | 21.1 | 16.8 | 16.1 |

¹Production is rough basis, but ending stocks are milled basis. ²World rice harvest stretches over 6-8 months. Thus, crop year represents the crop harvested in late 1979 and early 1980 in the Northern Hemisphere and the crop harvested in early 1980 in the Southern Hemisphere. ³Stocks are based on an aggregate of different local marketing years, and should not be construed as representing world stock levels at a fixed point in time. Also, stocks data are not available for all countries. Compiled from World Grain Situation, FAS.

Table 23.—World rice trade (milled basis): Exports and imports of selected countries or regions¹

| Country or region | Calendar year | | | | |
|---------------------|--------------------------|---------------|---------------|---------------|-----------------------|
| | 1980 | 1981 | 1982 | 1983 | 1984 as of March 8 |
| | <i>1,000 metric tons</i> | | | | |
| Exports | | | | | |
| United States | 2,977 | 3,008 | 2,487 | 2,330 | 2,100 |
| Argentina | 107 | 110 | 92 | 75 | 120 |
| Australia | 321 | 335 | 530 | 350 | 475 |
| Burma | 675 | 674 | 701 | 850 | 800 |
| China, Mainland | 1,116 | 583 | 460 | 550 | 550 |
| China, Taiwan | 261 | 92 | 307 | 550 | 375 |
| EC-10 | 804 | 624 | 823 | 839 | 788 |
| Egypt | 178 | 134 | 22 | 35 | 35 |
| Guyana | 81 | 78 | 35 | 45 | 40 |
| India | 423 | 1,143 | 633 | 165 | 175 |
| Japan | 653 | 795 | 318 | 721 | 200 |
| Korea, N. | 284 | 200 | 250 | 250 | 250 |
| Nepal | 10 | 43 | 50 | 0 | 0 |
| Pakistan | 971 | 1,127 | 794 | 1,299 | 1,300 |
| Philippines | 231 | 83 | 0 | 40 | 0 |
| Thailand | 2,700 | 3,049 | 3,620 | 3,700 | 3,700 |
| Uruguay | 165 | 215 | 227 | 171 | 225 |
| Other ¹ | 774 | 647 | 460 | 530 | 601 |
| World trade | 12,731 | 12,940 | 11,809 | 12,100 | 11,734 |
| Imports | | | | | |
| Bangladesh | 168 | 34 | 415 | 64 | 125 |
| Brazil | 239 | 142 | 124 | 400 | 175 |
| Canada | 99 | 99 | 108 | 115 | 120 |
| China, Mainl. | 18 | 110 | 250 | 75 | 100 |
| Cuba | 224 | 199 | 200 | 200 | 200 |
| East Europe | 328 | 353 | 291 | 299 | 296 |
| EC-10 | 889 | 1,079 | 1,135 | 1,147 | 969 |
| Hong Kong | 359 | 362 | 365 | 365 | 365 |
| Indonesia | 2,040 | 543 | 332 | 1,175 | 750 |
| Iraq | 379 | 350 | 369 | 474 | 440 |
| Iran | 507 | 583 | 475 | 680 | 680 |
| Ivory Coast | 257 | 335 | 363 | 434 | 350 |
| Korea, Republic of | 822 | 2,292 | 228 | 221 | 250 |
| Kuwait | 85 | 95 | 100 | 110 | 110 |
| Malagasy | 177 | 191 | 357 | 250 | 200 |
| Malaysia | 167 | 267 | 403 | 352 | 450 |
| Mexico | 128 | 66 | 16 | 0 | 125 |
| Nigeria | 394 | 686 | 666 | 711 | 675 |
| Peru | 250 | 103 | 63 | 127 | 100 |
| Portugal | 20 | 128 | 110 | 60 | 110 |
| Saudi Arabia | 356 | 427 | 471 | 500 | 525 |
| Senegal | 304 | 340 | 321 | 365 | 375 |
| Singapore | 187 | 178 | 192 | 180 | 175 |
| South Africa | 126 | 134 | 146 | 164 | 165 |
| Sri Lanka | 189 | 168 | 217 | 165 | 190 |
| Syria | 39 | 72 | 102 | 120 | 120 |
| U.A. Emirates | 441 | 285 | 170 | 175 | 175 |
| USSR | 694 | 1,283 | 859 | 400 | 450 |
| Viet Nam, Soc. Rep. | 135 | 140 | 95 | 30 | 3 |
| Other | 2,210 | 2,210 | 2,866 | 2,692 | 3,036 |
| World Trade | 12,731 | 12,940 | 11,809 | 12,100 | 11,734 |

Compiled from World Grain Situation, FAS.

Table 24.—U.S. exports of all milled rice

| Destination | 1979/80 | 1980/81 | 1981/82 | 1982/83 |
|--------------------|-----------|-----------|-----------|-----------|
| <i>Metric tons</i> | | | | |
| N. America | 104,771 | 134,820 | 102,724 | 100,831 |
| Canada | 77,590 | 93,269 | 100,982 | 100,588 |
| Caribbean | 83,254 | 79,798 | 89,207 | 76,461 |
| C. America | 26,800 | 11,248 | 5,403 | 30,309 |
| S. America | 89,367 | 143,082 | 10,489 | 88,399 |
| Peru | 56,107 | 129,851 | 2,662 | 87,197 |
| W. Europe | 348,296 | 284,957 | 567,367 | 302,430 |
| EC-10 | 239,914 | 199,936 | 241,889 | 213,174 |
| E. Europe | 2 | 32,125 | 3,248 | 12,050 |
| Middle East | 688,669 | 463,996 | 757,121 | 659,366 |
| Iran | 31,105 | — | 147,168 | — |
| Iraq | 309,562 | 71,368 | 221,121 | 279,176 |
| Saudi Arabia | 169,538 | 257,020 | 277,743 | 279,061 |
| Africa | 494,251 | 646,021 | 787,819 | 617,418 |
| Liberia | 61,872 | 85,104 | 88,379 | 91,270 |
| Nigeria | 137,864 | 283,234 | 412,832 | 168,734 |
| Senegal | 15,622 | 23,591 | 1,045 | 24,896 |
| South Africa | 105,467 | 112,418 | 114,058 | 109,309 |
| Asia | 843,339 | 1,221,757 | 340,394 | 321,838 |
| Bangladesh | — | — | 22,634 | 67,310 |
| Indonesia | 225,144 | 138,845 | 15,764 | 63,440 |
| South Korea | 574,697 | 1,048,846 | 281,588 | 187,763 |
| Oceania | 9,333 | 9,842 | 18,140 | 9,560 |
| World | 2,705,926 | 3,027,646 | 2,681,912 | 2,218,663 |

— = 0

Compiled from U.S. Exports Over the Last 10 Years, FAS.

Table 25.—U.S. exports of regular milled rice

| Destination | 1979/80 | 1980/81 | 1981/82 | 1982/83 |
|--------------------|-----------|---------|---------|---------|
| <i>Metric tons</i> | | | | |
| N. America | 45,470 | 53,883 | 45,819 | 40,578 |
| Canada | 28,981 | 34,413 | 44,594 | 40,425 |
| Caribbean | 72,636 | 67,601 | 70,120 | 52,648 |
| C. America | 18,977 | 4,651 | 1,618 | 16,107 |
| S. America | 73,598 | 113,882 | 8,418 | 86,887 |
| Peru | 51,153 | 104,276 | 1,619 | 86,413 |
| W. Europe | 19,926 | 21,574 | 70,831 | 76,344 |
| EC-10 | 15,024 | 18,264 | 61,231 | 56,173 |
| E. Europe | 2 | 32,125 | 2 | 4 |
| Middle East | 491,081 | 186,178 | 477,621 | 306,993 |
| Iran | 31,105 | — | 147,168 | — |
| Iraq | 36 | 802 | 8,754 | 18 |
| Saudi Arabia | 10,276 | 21,020 | 45,240 | 3,390 |
| Africa | 142,511 | 239,951 | 186,478 | 244,107 |
| Liberia | 11,985 | 29,240 | 28,495 | 1,540 |
| Nigeria | 72 | 68,016 | 15,579 | 2,521 |
| Senegal | 13,771 | 22,750 | 71 | 24,302 |
| South Africa | 3,803 | 7,011 | 8,686 | 123,83 |
| Asia | 574,794 | 231,238 | 70,059 | 122,714 |
| Bangladesh | — | — | 22,633 | 67,310 |
| Indonesia | 208,166 | 128,552 | 6,598 | 52,048 |
| South Korea | 330,523 | 69,200 | 20,584 | 193 |
| Oceania | 5,056 | 6,656 | 10,822 | 7,687 |
| World | 1,461,896 | 957,739 | 941,789 | 954,070 |

— = 0

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Table 26.—U.S. exports of brown rice

| Destination | 1979/80 | 1980/81 | 1981/82 | 1982/83 |
|--------------------|---------|-----------|---------|---------|
| <i>Metric tons</i> | | | | |
| N. America | 35,026 | 45,241 | 38,943 | 42,027 |
| Canada | 34,830 | 35,469 | 38,548 | 42,010 |
| Caribbean | 239 | 588 | 978 | 1,130 |
| C. America | 3,518 | 30 | 17 | 12 |
| S. America | 23 | 18,542 | 143 | 404 |
| Peru | — | 18,476 | — | — |
| W. Europe | 169,542 | 131,206 | 180,967 | 104,989 |
| EC-10 | 100,314 | 109,368 | 133,000 | 90,422 |
| E. Europe | — | — | 259 | — |
| Middle East | 9,184 | 14,685 | 7,431 | 11,642 |
| Iran | — | — | — | — |
| Iraq | 6,831 | — | — | 11,539 |
| Saudi Arabia | 370 | 431 | 76 | 40 |
| Africa | 13,660 | 12,471 | 10,037 | 6,603 |
| Liberia | 8,891 | 4,693 | 4,086 | 5,229 |
| Nigeria | 597 | 1,666 | 441 | 150 |
| Senegal | — | — | 31 | — |
| South Africa | 4,141 | 5,724 | 3,866 | — |
| Asia | 244,221 | 979,808 | 260,978 | 187,502 |
| Bangladesh | — | — | — | — |
| Indonesia | — | — | — | — |
| South Korea | 244,174 | 979,589 | 260,978 | 187,461 |
| Oceania | 16 | 146 | 2,798 | 39 |
| World | 475,430 | 1,202,717 | 502,552 | 354,349 |

— = 0

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Table 27.—U.S. exports of parboiled rice

| Destination | 1979/80 | 1980/81 | 1981/82 | 1982/83 |
|--------------------|---------|---------|-----------|---------|
| <i>Metric tons</i> | | | | |
| N. America | 11,394 | 15,556 | 12,910 | 13,444 |
| Canada | 11,386 | 15,519 | 12,797 | 13,432 |
| Caribbean | 6,052 | 9,985 | 17,643 | 22,278 |
| C. America | 150 | 268 | 273 | 1,234 |
| S. America | 8,123 | 166 | 519 | 151 |
| Peru | — | 33 | 1 | 6 |
| W. Europe | 88,377 | 118,910 | 126,049 | 112,594 |
| EC-10 | 54,918 | 40,898 | 65,538 | 58,090 |
| E. Europe | — | — | 209 | — |
| Middle East | 185,359 | 262,084 | 269,693 | 339,203 |
| Iran | — | — | — | — |
| Iraq | — | 2,305 | 3,275 | 21,937 |
| Saudi Arabia | 157,978 | 235,503 | 231,319 | 274,253 |
| Africa | 297,855 | 373,833 | 572,539 | 356,550 |
| Liberia | 40,304 | 51,085 | 55,692 | 84,351 |
| Nigeria | 137,195 | 213,409 | 396,792 | 166,063 |
| Senegal | 172 | 283 | 351 | 175 |
| South Africa | 97,451 | 98,698 | 100,866 | 96,913 |
| Asia | 203 | 29 | 31 | 69 |
| Bangladesh | — | — | 1 | — |
| Indonesia | — | — | — | — |
| South Korea | — | 4 | 25 | 47 |
| Oceania | 924 | 826 | 1,010 | 947 |
| World | 598,437 | 781,657 | 1,000,876 | 846,469 |

— = 0

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Table 28.—U.S. exports of other rice: (rough, broken, nec)¹

| Destination | 1979/80 | 1980/81 | 1981/82 | 1982/83 |
|--------------------|---------|---------|---------|---------|
| <i>Metric tons</i> | | | | |
| N. America | 12,881 | 20,140 | 5,051 | 4,783 |
| Caribbean | 4,326 | 1,624 | 466 | 404 |
| C. America | 4,156 | 6,298 | 3,495 | 12,956 |
| S. America | 7,624 | 10,492 | 1,409 | 958 |
| W. Europe | 70,451 | 13,266 | 189,521 | 8,502 |
| E. Europe | — | — | 2,778 | 12,047 |
| Middle East | 3,044 | 1,050 | 3,425 | 4,953 |
| Africa | 40,224 | 19,766 | 18,765 | 10,158 |
| Asia | 24,120 | 10,683 | 9,325 | 11,554 |
| Oceania | 3,338 | 2,214 | 3,509 | 886 |
| World | 170,162 | 85,533 | 236,696 | 63,775 |

¹Nec: Rice not elsewhere classified. — = 0

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